SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

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FRIDAY, AUGUST 8, 1902.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. SECTION H—ANTHROPOLOGY.

DURING the period of the fifty-first meeting of the American Association for the Advancement of Science at Pittsburgh, June 28 to July 3, 1902, there was held the founding meeting of the American Anthropological Association. This gave a double impulse for the attendance at the meeting of the anthropologists of the country, including those of Section H, and consequently there were present at the sessions of Section H many of the foremost anthropologists, whose interest was sustained until the close of the session.

Section H was organized, in the audience room of Bellefield Church, on Monday morning, June 30, immediately after the adjournment of the general session, and, with two later mentioned exceptions, held all of its sessions in the same place. The officers for the meeting were as follows:

Vice-President, Stewart Culin.
Secretary, Harlan I. Smith.
Member of Council, W J McGee.
Sectional Committee, J. Walter Fewkes, vice-president Section H, 1901; George Grant MacCurdy, secretary Section H, 1901; Stewart Culin, vice-president Section H, 1902; Harlan I. Smith, secretary Section H, 1902; Franz Boas, George A. Dorsey, William H. Holmes.
Member of General Committee, Walter Hough.

During the meeting the following members interested in anthropology were elected

fellows: Livingston Farrand, William C. Mills, Charles L. Owen, A. E. Jenks, A. H. Thompson, J. D. McGuire, Frank W. Blackmar, William Wallace Tooker and William Henry Goodyear.

The reports of the committees on the teaching of anthropology in America and on anthropometry, and the resolutions on the American International Archeological Commission, having been adopted by the Council, were printed in the account of the meeting by the general secretary (SCIENCE, pp. 45, 46).

THE COMMITTEE ON THE PROTECTION AND PRESERVATION OF OBJECTS OF ARCHEOLOGICAL INTEREST REPORTED PROGRESS.

Thomas Wilson, LL.D., Curator of Prehistoric Anthropology in the Smithsonian Institution, died May 4, 1902, at the age of seventy. He became a member of Section H of the American Association for the Advancement of Science in 1888, was made a fellow at the thirty-sixth meeting and was elected vice-president of Section H for the forty-eighth meeting, which was held in 1899.

REPORT OF THE COMMITTEE ON THE DEATH OF DR. THOMAS WILSON.

The committee appointed by Section H of the American Association for the Advancement of Science to suggest action on the death of one of its esteemed members, has the honor to make the following report:

WHEREAS, the death of Dr. Thomas Wilson, a former vice-president of the Association, has deprived us of one whose presence at our meetings has contributed much to their value, and has deprived prehistoric science of an indefatigable and earnest worker; in order to express our high appreciation of his worth and labor, we recommend the following resolutions:

Resolved, That in the death of Dr. Thomas Wilson the Association has lost a most efficient and industrious worker in the field of prehistoric archeology, the example of whose devotion to science is worthy of emulation.

Resolved, That a copy of these resolutions be sent to his widow and family and that a second copy be placed among the records of the section.

WARREN K. MOOREHEAD,
STEWART CULIN,
HARLAN I. SMITH,
J. WALTER FEWKES.

The report was adopted by the Section.

The following resolution was presented by Franz Boas and adopted by the Section:

Resolved, That it is the sense of this meeting that it is desirable to bring about the closest possible correlation between the work of Section H of the American Association for the Advancement of Science and the American Anthropological Association.

Retiring Vice-President Fewkes delivered his address, 'Prehistoric Porto Rico,' Monday afternoon in the Oakland church. It was printed in SCIENCE of July 18, 1902.

Following is a list of the discussions and papers presented. Each title is accompanied by an abstract whenever such could be secured from the author.

TUESDAY, JULY 1.

Discussion of the relations of Section H to the American Anthropological Association.

The Human Effigy Pipe, taken from the Adena Mound, Ross Co., Ohio: by WILLIAM C. MILLS.

This pipe is one of the most wonderful pieces of art taken from the mounds of Ohio. It is tubular in form and represents the human body in the nude state, with the exception of a covering around the loins. On the front of this covering is a serpentine scroll and in the back it is tied and hangs

down as an ornament. The pipe is eight inches in length and made of fire-clay unburned. This fire-clay can be duplicated in a number of places along the Scioto River and farther down toward the Ohio. The paper was illustrated by pictures of the pipe and a sample of the fire-clay.

The paper was discussed by J. D. McGuire, J. Walter Fewkes and Warren K. Moorehead. Special attention was called to the fact that pipes were often used to blow out smoke on ceremonial occasions rather than only for drawing in smoke for pleasure.

Gravel Kame Burials in Ohio: WARREN K. MOOREHEAD.

This paper dealt with a class of prehistoric remains found in Ohio and which have, up to the present, scarcely attracted the attention of archeologists. The author spent ten or twelve seasons in the exploration of Ohio mounds and other remains.

The Kame burials, he said, are found in the gravel knolls of supposed glacial origin. These burials may or may not be older than the remains of the so-called 'mound-builders'; this is a question as yet undetermined.

The crania seem to him different from those of the mound interments, and he said that certainly some of the artifacts taken from the gravel burials do not have their counterparts in the tumuli finds. The skeletons are better preserved and therefore more sought by the anatomists. Moisture, by reason of the porous nature of the sandy soil or gravel, percolates below the bones and leaves them dry. It is not unusual to find almost every bone of the body well preserved. Burials in earth mounds or in cemeteries when in clay and other compact soils are frequently badly decayed—sometimes only the crown of the teeth remaining.

Attention was called to these differences and comments from other archeologists were requested. He endeavored to prove that the burials in gravel knolls mark the existence of a different tribe from that supposed to have been responsible for the mounds and earthworks.

Microscopical Sections of Flint from Flint Ridge, Licking Co., Ohio: WILLIAM C. MILLS.

This paper attempted to prove that the Flint Ridge material contains foraminifera, in opposition or correction of the photographs of microscopical sections and statements of Professor Thomas Wilson in his 'Arrowheads, Spearpoints and Knives of Prehistoric Times.' Dr. Mills said he had made sections of nearly all the different varieties of flint found in this prehistoric quarry, and found that certain portions of the flint are full of foraminifera. He exhibited drawings of these various forms and illustrated other features by means of thin sections of flint mounted for the microscope.

The Hernandes Shell-heap, Ormond, Florida: C. H. HITCHCOCK.

This paper described the shell-heap on the Spanish Grant. Twenty kinds of mollusca were found. Bones of the deer, two kinds of dogs, opossum, wolf and many of the porpoise, alligator and turtles, as well as of several fish, were also secured. Some implements were found, but the most important discoveries were those of the bones of the great auk. One bone was first collected by Professor Blatchley. The identity of the bone is now confirmed, so that the range of this bird is supposed to have reached as far south as Florida within the human period. Specimens of the bones were exhibited and a blackboard diagram was made to explain the site.

The paper was discussed by O. P. Hay, Harlan I. Smith and J. D. McGuire. The latter suggested that persons of the white race might have taken the auk bones to the region during the last four hundred years.

The Late Dr. Thomas Wilson: Warren K. Moorehead.

This paper included some brief remarks upon the career of the archeologist, Dr. Thomas Wilson, late curator of the Department of Prehistoric Anthropology, Smithsonian Institution. Dr. Wilson has conducted researches in both France and the United States, and published numerous reports and papers, notable among which are two, 'The Swastika' and 'A Classification of Spearheads, Arrowheads and Knives.' Dr. Wilson was greatly interested in young men who desired to take up anthropology as their life work. He was possessed of a peculiarly pleasing personality.

An Osage Mourning—War Ceremony: George A. Dorsey.

AFTERNOON SESSION.

This paper was discussed by Franz Boas, who said, among other things, practically as follows: In ritual we find perhaps the most permanent activity of primitive man. The explanations of similar rituals are often given by various tribes and found to differ fundamentally. Actions seem more permanent than thoughts or the psychological explanation of such acts. The study of ritual may solve problems the explanations of which we are unable to discover from the study of other matters. We should be thankful for such detailed description of rituals as those given by Dorsey, Fewkes, Voth and others, particularly regarding the Southwest.

J. Walter Fewkes stated that Dr. Dorsey's paper well illustrated the advantage of the study of primitive religion. The study of ceremony as an objective element in religion is very important. Such studies accumulate matter we can not now appreciate, but ceremonies are rapidly disappearing or being modified, so that we may live to see the end of them and we must now make the records. Papers of this kind should increase. We should have all details and interpretations when possible.

The observer has better opportunities, and is in many cases more competent to explain, than any one else. The true explanation in many cases is not known to the participants. The meaning is only obtained by comparative study. So it is necessary to record all events. The value of recording what every man does is important, so we may have in print material for such comparison.

A few ceremonies remain, more than some think, but the incorporation of foreign elements is everywhere marked. The study of ceremony has strong and weak sides; strong as above stated. The weak side is due to the probability that ceremonies may change. Records of changes, therefore, should be made in order to trace the evolution of ceremonies. Not only what is done, but also what is said and the songs and prayers, should be recorded.

W J McGee expressed the following ideas: Peoples who participate in ceremonies can seldom explain them, any more than a caged bird can tell why it beats its wings in vain effort to migrate south in the fall. Ceremonies are instinctive, running far back. The Indians who perform seldom realize that this is so. They hardly recognize the existence of laws governing the ceremonies. Through the heritage of experience, movements take place definitely in accordance with law. We know that the points of the compass are prominent in the rituals of all our primitive peoples. We who no longer have occasion to remember points of the compass find one of our strongest instincts is to carry orientation. It is an instinct, and typical of what has come up from lower stocks than those represented by the Indians described by Dr. Dorsey and others.

The instinct differs only in so far as some peoples have lost some of theirs. The

fittest instincts have been preserved. Rituals are, in a way, records of partly instinctive habits controlled by law stronger by far than the minds of the men who perform the ceremonies.

Walter Hough expressed the following ideas: In some cases one man thinks for a community. The ceremonies in Hopi may be likened to a university education, beginning with childhood and ending at death. In the ceremonies the older persons teach the younger.

Dr. Dorsey said that the more he learned the greater the number of ceremonies he found still existed. He had seen ten distinct ceremonies in one week.

Anthropological Museums in Central Asia: G. FREDERICK WRIGHT.

One of the agreeable surprises awaiting the American traveler in Siberia is the evidence which he sees in every center of population of an intelligent interest in archeological and anthropological investigations. Indeed, there is scarcely a town of ten thousand inhabitants in all Siberia but has a public museum, under the care of a learned and competent curator, in which special attention is devoted to these subjects. There are such museums, finely housed, in the young cities of Valdivostock and Blagovestchensk; while in the older centers of population the museums often rival anything which we have in this country outside of Washington, New York, Boston and Chicago.

One of the finest of these museums is that of the branch of the Imperial Geological Society which has been formed at Khabarovsk, the capital of the Maritime Province, on the Amur River. The Museum of the Society occupies one of the largest and best-situated brick buildings of the city. Like all the museums in Siberia, it is largely devoted to matters of local interest. But an immense amount of both expense and pains has been devoted to its perfection and usefulness, and it is one in which all, both officers and people, take a just pride.

The museum at Irkutsk is of still longer standing, and is enriched by the accumulations of well-nigh a century of intelligent exploration and research. The museum building in Irkutsk is also one of the finest in the city. But perhaps the most interesting and important museum in Siberia is that of Minusinsk. Here, under the skillful guidance of Mr. M. Martianof, the principal druggist of the town, a museum has grown up which attracts anthropologists from Moscow, Copenhagen and indeed all parts of the world. The museum is well housed in a large brick building.

Other museums of much importance are to be found at Krasnoyarsk, Yeniseisk, Tomsk, Omsk, Biisk, Tashkent and Tiflis. That of Tashkent is at the present time receiving valuable additions illustrative of the civilization of the Græco-Bactrian kingdom, which followed the conquest of Alexander. The museum at Tiflis is one of the largest and best arranged of all in Asiatic Russia, and is fortunate in still having the benefit of the supervision of the distinguished botanist Radde.

All these museums are supported and have been mainly built up by private contributors and are the object of much pride on the part of the people. Taken together, they represent an educational factor which is developed much more fully in Asiatic Russia than it is in America, and may well provoke our emulation.

Climatic Changes in Central Asia traced to their Probable Causes, and discussed with Reference to their Bearing upon the Early Migrations of Mankind: G. FREDERICK WRIGHT.

That there have been extensive climatic changes in Central and Western Asia in

recent times is made evident by a variety of considerations.

I turn with favor to the natural explanation offered by the theory of an extensive subsidence of the Asiatic continent, approximately contemporaneous with the accumulation of ice during the glacial period over North America and Europe. Such a subsidence would produce thus in Central Asia an internal sea as large and deep as the Mediterranean. This vast body of water in Central Asia would add so much to the evaporating surface that it would naturally largely increase the rainfall upon the bordering mountains to the north.

There are numerous indications that Turkestan has been one of the most important centers, if not the original center, from which the human race has radiated. Here the conditions of life are still extremely favorable, and during earlier climatic conditions were even more favorable than now. All Central Asia is most admirably situated for irrigation. All along the base of the Hindu Kush, the Tian Shan, the Alexandrofski, the Ala-tau, and the Altai range there is a broad rich belt of loess, the most fertile soil in the world when well watered, and the water for its irrigation is near at hand.

The conditions were preeminently favorable for the early development of civilization. Even now the population along this irrigated belt is dense. But it is evidently far less than at a former time. Doubtless this is partly due to the disorganized political condition which has long characterized the region, but in no small degree it is probably due to the diminution of the water supply. In driving over the country one finds in various places the remains of irrigating ditches long since abandoned, and sees innumerable mounds indicating a former population where now scarcely any is to be found.

In the same line it is also instructive to notice the many indications of a constant migration from this center. By far the most important theory of the origin of the Aryan languages would fix it in Bactria, from which center Aryan-speaking people in prehistoric times migrated to India on the one side and to Persia and Europe upon the other. This too, was the probable center of the Mongolo-Tartar races, whose families radiated thence to Malaysia and China on the one side, to Turkey, Hungary and Finland upon the other, and, spreading out over the vast wastes of Siberia, across into America, peopled the western continent.

When we come to know the whole history of the great Tartar migrations it is likely that we shall find that the gradual desiccation of the country through the climatic changes had much to do with it all.

The paper was illustrated by a map and was discussed by J. Walter Fewkes, J. D. McGuire, Harlan I. Smith, W J McGee, Stewart Culin, William H. Holmes and others.

Mortuary Ceremonies of the Cocopa Indians: W J McGee.

The Cocopa Indians occupy the lower part of the valley of Colorado River, their territory extending from the International Boundary to the head of tides and salt water entering from the Gulf of California. Although they subsist in part by fishing and the chase, they are essentially agricultural. By reason of the floods of the Colorado they are driven annually from the bottom lands of the river to the higher grounds, just as were the ancient Egyptians occupying the valley of the Nile. The annual migrations are of great regularity, and have affected the habits of the tribe in various ways. One consequence of the enforced abandonment of homes during each summer is an enfeebled home sense; and this is connected with mortuary customs,

both directly and through an obscure mythology. On the death of an adult his small properties are collected for distribution among non-relatives, while the body is placed on a rude bier and fuel is gathered for cremating it. Especially if the decedent is a householder, intelligence of his death spreads rapidly and fellow tribesmen of other clans, as well as Indians of other tribes, and even Mexicans and Americans, gather and help themselves to such property as weapons, fishing-tackle, stored grain and other food supplies, fowls, horses, saddles and bridles, and other chattels. Meantime the pyre is being arranged alongside the house, and any remnants of the chattels (or all, in case claimants have not appeared) are placed on and about it; and about the end of the second day this is fired. The light-framed house soon catches from the pyre and is consumed with it, while any neighboring houses belonging to the family or clan also take fire, either naturally or by the help of the mourners, so that the entire homestead is destroyed. The surviving members of the family abandon the site forever; and it is shunned for years by other families of the tribe.

This paper was discussed by George A. Dorsey, Walter Hough and J. D. McGuire.

The Section adjourned to Bellefield School for the following two papers, in order to avail itself of lantern facilities.

A Collection of Crania from Gazelle Peninsula, New Pomerania: GEORGE GRANT MACCURDY.

This is a comparative study of twenty-four crania belonging to individuals from the tribes of Gazelle Peninsula, New Pomerania. They were procured in 1894, through Mr. Frederick Mueller, of Amsterdam, by Dr. John S. Billings, then in charge of the U. S. Army Medical Museum. Their provenience is attested by Dr. J. D. E. Schmeltz, Director of the National Museum of Ethnography, Leyden.

The collection is owned by the Free Museum of Science and Art, University of Pennsylvania, the director, Mr. Stewart Culin, kindly forwarding it to Yale University Museum for purposes of study.

The skulls are small and all dolichocephalic. The minimum and maximum frontal diameters are small, averaging, respectively, 20.3 mm. and 25.7 mm. less than for English crania. The height averages greater than the greatest breadth, a character called hypsistencephaly; the crania are prognathous, platyrhine, platyopic, phænozygous and megadont. Glabella and superciliary arches are prominent. Apertura pyriformis is simian in character. Fossæ caninæ are pronounced. The teeth are well preserved and not crowded. The wisdom teeth are lacking in none. There is a tendency toward a division of the root in the first upper premolars. The alveolar arch of the upper jaw projects considerably beyond the third molars (in one case as much as 12 mm.). The percentage of first lower premolars with anterior roots is high; the spina mentalis is practically wanting, and the angle of symphysis is large. The paper was illustrated by lantern pictures.

Burials of Adena Mound: WILLIAM C. MILLS.

This paper discussed the difference between the various burials of the Adena Mound, which was in Ross Co., Ohio. It was illustrated by lantern pictures.

Adena mound was cone-shaped, 26 feet in height, with a circumference of 445 feet. The outer surface of the mound was covered with a leaf-mold from three to seven inches thick. As work progressed upon the mound, it was discovered that it had been built at two different periods; the first period is represented by the original mound, which was twenty feet high, with a base

diameter of ninety feet, being composed almost entirely of dark sand. The second period is represented by the enlargement of the mound upon all sides. However, on the south side the mound was only covered with a few feet of soil, while on the north side the base was extended more than fifty feet, changing the apex between twelve and fifteen feet. The mode of burial in the first period was far different from that in the second. In the original mound no burials were found until within five feet of the base line, and all of the bodies were enveloped in bark or a coarse woven fabric and then enclosed in a rude sepulcher made of timbers, while in the second period the bodies were simply covered with soil; not even a trace of bark was found with the skeletons. However, the implements and ornaments of the first period were similar to those of the second period.

WEDNESDAY, JULY 2.

Meeting with the American Folk-Lore Society.

Cooperation Between the Anthropological Museum and the Public School: FREDERICK HOUGHTON.

This paper touched on the importance of the place occupied on the school curricula by the natural sciences; the requirements and difficulties of teachers, in teaching the sciences in elementary schools; and the desirability from the teacher's viewpoint of help, in her work, from the science museum, in the form of lectures for teachers and pupils and of exhibits for the use of schools.

From a museum point of view, it spoke of the desirability of enlarging the usefulness of the museum, in the great field open to it in cooperating, in the work of education, with the public-school system.

The body of the paper was devoted to an outline of work possible for a museum to do in connection with the school. This was commented upon, both from the viewpoint of the teacher and from that of the museum, and experiments made by the Buffalo Society of Natural Sciences along the lines laid down in the outline were described at some length as being illustrative of the work outlined.

This paper was favorably discussed by W J McGee and is to be published in full in the *Journal of Education*.

Uses of Archeological Museums in Education in the Public Schools: LEE H. SMITH.

This paper was read by title.

Explorations of 1901 in Arizona: WALTER HOUGH.

This paper gave an account of one of the most important explorations carried on for the National Museum in the pueblo region during five months of 1901, describing ruins on the Apache Reserve, the White Mountain plateau, the petrified forest, southwest of Holbrook, north of Holbrook and on the Hopi Reserve. The field selected for examination lies in eastern Arizona and extends from Fort Apache to the Hopi Reserve, a distance of 180 miles and east, and west of Holbrook, a distance of about 60 miles.

During the month of May Dr. Hough explored the ruins of McDonald's Canyon and at the petrified forest, securing about 1,000 specimens. On the first of June he took charge of the scientific work of the Museum-Gates Expedition which was financed by Mr. P. G. Gates, a man of wealth interested in pueblo archeology.

Dr. Hough said that in the course of the season's work of five months in 1901, sixty ruins were visited and eighteen of them excavated. Some idea of the difficulties encountered, aside from the 800 miles of wagon travel, may be gathered when it is known that five of the groups required dry camps, water being hauled considerable dis-

tances for men and animals. The work, however, was quite successful, 3,000 specimens having been collected. Plans of 24 pueblos and maps showing the location of the groups were drawn and ethnological data, specimens and photographs secured from the Apache, Navajo and Hopi Indians visited during the season. This material will be published in the 'Annual Report of the U. S. National Museum' for 1901. The paper was illustrated by a map and discussed by J. Walter Fewkes.

The Throwing-stick of Prehistoric People of the Southwest: GEORGE H. PEPPER.

The throwing-stick as found in the Southwest was used by a prehistoric people who occupied a restricted area in southeastern Utah and northeastern Arizona. In form it is similar to the Mexican atlatl and its nearest neighbor is from the State of Coahuila of that country.

The throwing-stick from the Southwest is represented by three perfect specimens, so far as known; these are supplemented by a few incomplete specimens and fragments. They are made of a hard springy wood and have handles in the form of loops, which are made of rawhide.

The spears or darts used with this weapon present many interesting features. They were of the compound form, being composed of a main shaft and a stone-pointed fore shaft. The main shaft was made of wood or reed. One end presented a slight depression which fitted the spur of the throwing-stick. The other end was drilled to the depth of an inch to receive the pointed end of the fore shaft. The main shaft, in some instances, was feathered, but the evidence at hand is too meager to determine whether this was the usual form or merely a variant.

The fore shafts were generally made of wood, having for a point a chipped blade of stone. They varied in size and form, some being so large that it would seem that they might have been used as fore shafts of spears. These fore shafts are similar in form to the hafted knives used by the same people; the only difference is the finish of the handles, one being pointed, whereas the other is squared.

Of the three throwing-sticks mentioned, one is the property of Professor Frederick Starr, of the University of Chicago, the second is in the State Collection in Salt Lake City, Utah, and the third is in the Hyde collection, American Museum of Natural History, New York. In the University of Pennsylvania there are two specimens, but one is broken and the other has no finger loops.

This paper was illustrated by photographs and discussed by Stewart Culin, J. Walter Fewkes and W J McGee. It will be published in the *Bulletin of the American Museum of Natural History.*

AFTERNOON SESSION.

Meeting with the American Anthropological Association.

A War Festival of the Hopi Indians: J. WALTER FEWKES.

This paper discussed the room of the war god, preliminary assembly, meeting of warriors, greater and lesser festivals, the bison dance, and concluded with general remarks on the festival.

A Rare Form of Sculpture from Eastern Mexico: MARSHALL H. SAVILLE.

This paper described a rare form of sculpture from the region of the Totonacans in the States of Vera Cruz and Puebla. Less than a dozen examples are known. The example in the collection of the American Museum of Natural History is notable for the striking resemblance of the masked human figures with snakes in the mouths to the snake dancers of the Hopi or Moqui Indians of Arizona. Other examples shown

in photographs show a resemblance to the figures seen in the bas reliefs of Santa Lucia, Cozumahualpa, Guatemala. These sculptures are found in the same region where many of the stone yokes have been discovered, and probably have some relationship with those enigmatical objects.

This paper was illustrated by photographs and a very artistic sculpture loaned for the purpose by Dr. W. J. Holland, Director of the Carnegie Museum. It was discussed by J. D. McGuire, Walter Hough, William H. Holmes and J. Walter Fewkes.

The Possible Origin of the Folk-Lore about Various Animals: H. A. Surface.

This paper was read by title.

The Place of Anthropology among the Sciences: W J McGee.

Anthropological Museums and Museum Economy: Stewart Culin.

The modern science of anthropology is at once the youngest and the most complex of the sciences—indeed, it is in large measure the outgrowth of all the older branches of definite knowledge. The keynote of astronomy, the earliest of the sciences, may be said to be gravity, while that of chemistry, the next oldest science, may be defined as affinity; yet since chemical relations are at least indirectly controlled by gravity, the basis of the later science is really gravity +affinity. So, too, the keynote of botany, or phytology, is vitality, yet this property of plat-matter is but superadded to the gravity and the gravity+affinity with which the two older sciences are concerned. In the realm of zoology, motility, or the power of self-movement, is added in turn; and in anthropology, mentality, in all its bearings on conscious self-activity, becomes the keynote —yet this distinctive property is only added to the motility, vitality, affinity and gravity to which the leading older sciences are especially devoted.

Classification and Arrangement of the Collections of an Anthropological Museum: William H. Holmes.

This paper in a more developed form is to be published in the ' Annual Report of the U. S. National Museum,' for 1901.

Methods of Collecting Anthropological Material: Harlan I. Smith.

This paper stated that there are three methods of collecting anthropological material, namely, the research method, the synoptic method and the casual method. It concluded that for economy, efficiency and accuracy in diffusing knowledge, the synoptic method of collecting should be replaced by exchange, and that the research method is of the highest type, furnishing all the material results produced by the other methods.

The paper is to be published in the *Wisconsin Archeologist,* Vol. 1, No. 4, May, 1901.

The Preservation of Museum Specimens: Walter Hough.

It is the province of the museum worker to check insects as far as possible, and to his aid come chemistry and entomology. The subject is vital, not only to the museums, but to a vast number of people.

The wonderful advance of chemistry has given us a number of substances useful for the deterring or extermination of moths. Some of these are disagreeable and dangerous, unsuitable for domestic use, though available for the Museum.

The methods of poisoning specimens practiced in the National Museum suggest that a portion of the process may be employed for domestic use. This may be done by securing an air-tight box—a packing-box lined with manila or grocer's paper answers—placing the fabrics or objects therein, and after pouring in gasoline liberally, closing the lid tightly, and leaving it for a day or so. It has been found that woolens,

furs, etc., treated in this way will not be subject to the attack of moths for a long time, as the oily substances in the animal fibers on which the moths feed have been removed to some extent, leaving the fabric undesirable. Decorative objects, with which one does not come in immediate contact, may be brushed with a weak solution of corrosive sublimate in alcohol, one fourth ounce to the quart.

The paper summarized the experience gained during the past seventeen years in the treatment necessary to preserve museum specimens from attacks of insects, from dampness, dust, etc.

The Australian Native: J. A. FOWLER.

This paper was illustrated by pictures and read by title.

The Growth of Children: F. BOAS.

This paper was read by title on motion of the author.

Charcoal Covered by Stalagmite from Put-in-Bay: E. L. MOSELEY.

In Perry's Cave charcoal in different layers of stalagmite shows that fires were built in the cave at times separated by considerable intervals. A specimen of charcoal, which was exhibited, has a stalagmitic covering about two inches thick.

The Sandusky Engraved Slates: E. L. MOSELEY.

Two argylite pendant ornaments were exhibited. One was engraved with a proboscidean on one side and a coiled rattlesnake on the reverse. The other was engraved on each side with an Indian face. The circumstances of their finding were narrated.

The aboriginal character of the engravings was questioned.

Exhibition of a Modern Clay Tablet from Michigan: HARLAN I. SMITH.

A clay tablet from Michigan, and bearing impressions, was exhibited. The object is of recent manufacture and bears no resemblance to native American art. It was probably made and deposited, as have been many similar objects, for deceptive purposes and was exhibited in opposition to such an end.

Square Occipital in the Cranium of a Modern Othomi Mestizo: DR. NICOLAS LEON, Professor of Anthropology and Ethnography in the Museo Nacional, Mexico.

From among the mortuary spoils which now and then are exhumed from the municipal pantheon of Tula Allende, State of Hidalgo, Mexico, and which are thrown into a common place called the ossuary, was taken out, a short time ago with other Othomi skulls, the one which is the object of the present communication.

It has all of the characters of a masculine cranium, well defined, of about forty years of age, and without notable asymmetry.*

An examination of the various parts of the face and the margins of the anterior apertures of the nasal fossæ manifest the anatomical particularities of the American Indian race. The author was able to acquire some information respecting the individual to whom this cranium pertained, and supposes it was the son of an Othomi Indian father of pure blood and of a woman descended from the whites, that is, it was that of a mestizo. The anatomical particularity of this skull is worth pointing

* The author is now preparing a critical study of all the publications referring to the anthropology of Mexico, especially those given to the light by Mexicans. Figuring among them is the paper of a pseudo-anthropologist who pretends to obtain general laws of the biology and somatology of the Mexican aborigine, giving as racial characters some anomalies, badly observed and interpreted, and deducing from a small number of osteological measurements, by manipulation, general laws. The title of this work is 'Anthropologie Mexicaine Osteologie,' Mexico, 1900.

out; it is the geometric form of its occipital, which is nearly square.

It is certain that this does not constitute (and less in an isolated case such as the present) a racial characteristic; it is presented only as data that will aid in the study of the morphology of the occipital bone, which it is thought will supply the explanation of its anomaly. It is useless to expound the theory of the development of the occipital, for it is well known by all who occupy themselves with the anatomical sciences.

In all of my studies I have never encountered a similar case and it is desirable that this isolated datum may be utilized. For this reason it is brought to the attention of the fellows of this Association.

This paper was illustrated by a photograph and read by title.

Evanescent Congenital Pigmentation in the Sacro-Lumbar Region: Harriett Newell Wardle.

The purpose of this paper was not to record any new observation, but to call to the attention of American anthropologists the various aspects of the questions relating to the occurrence of well-defined pigmented areas, chiefly in the sacro-lumbar region common upon a large percentage of the children of certain of the darker races. The stigmata fade away in from two to eight years. Their presence has been observed sporadically over a wide geographic territory reaching from Greenland in the east to Madagascar in the west—Danish Greenland, Vancouver, Hawaii, Samoa, Korea, Japan, China, the Philippines, the Celebes, Java, Malay archipelago, Indo-China, Madagascar,—thus appearing in many ethnic divisions. Nevertheless they have been elevated to the position of a racial character and called 'Mongolian marks.' No effort has as yet been made to inquire into their biological significance. The hypothesis is offered that these evanescent congenital pigmented areas are the nuclei of more general pigmentation, the regions wherein occurs the first deposition of the cutaneous pigment normal to the darker races and peoples, and that their apparent disappearance may be explained by the deepening of the tint of the whole body surface. When it is remembered that the cells of the rete mucosum are derived from those of the dermis, the fact becomes very significant that the pigment of the so-called Mongolian marks is situated, not in deep epidermal cells, but in the underlying dermal tissue, for it would seem to be precisely in the latter layer that the earliest carbonous deposit should be expected.

This paper was read by title.

The newly elected officers for the Washington meeting are:

Vice-President, George A. Dorsey, Curator of Anthropology of the Field Columbian Museum, Chicago.

Secretary, Roland B. Dixon, Instructor in Anthropology, Harvard University, Cambridge.

Harlan I. Smith,
Secretary.

THE NORTH CAROLINA SECTION OF THE AMERICAN CHEMICAL SOCIETY.

The sixth annual meeting of the North Carolina Section was held on Saturday, May 17, 1902, at 11 A.M. in the office of State Chemist, Agricultural Building, Raleigh.

After the transaction of some miscellaneous business the following resolution was unanimously adopted:

In the death of Hugh Lee Miller on February 5 last the North Carolina Section of the American Chemical Society sustained its first and deep loss of one of its charter members. After graduation from the State University in 1890, where he served one year as assistant in the chemical department, he acceptably filled an instructorship in the Agricultural and

Mechanical College. His efficiency and refined character evidenced themselves in the affection of his students. He carried his culture and high standard of rectitude into commercial work, serving as chemist and subsequently general manager of the Nauassa Guano Co., of Wilmington, N. C. On the absorption of that corporation by the Virginia-Carolina Chemical Company he was promoted to the position of superintendent in charge of South Carolina Division. He was married, April 10, 1901, to Miss Purden Smith, of York, Pa. The dread disease phthisis deprived technical chemistry in the South of an able, conscientious, high-minded worker, and us of a much beloved friend.

The officers elected for the ensuing year were:

President, Chas. E. Brewer; *Vice-President*, G. S. Fraps; *Secretary-Treasurer*, C. B. Williams; *Councilor*, B. W. Kilgore; and *Executive Committee*, Chas. E. Brewer, G. S. Fraps and C. B. Williams.

The program as presented and discussed was as follows:

Molecular Attraction: J. E. MILLS.

Assuming that the total intrinsic energy of a molecule is the same in the liquid as in the gaseous state, it is shown that the change in the latent heat of vaporization at different temperatures can be accounted for, to a fair approximation, on the supposition that the attraction between the molecules varies inversely as the square of their distance apart. Other lines of argument advanced to prove this assumed law of attraction agree well with the observations.

The conclusions drawn are that the molecular attraction, like the attraction of gravitation, varies inversely as the distance apart of the molecules and does not vary with the temperature. Unlike gravitation, the attraction does not depend *primarily* upon the mass, but upon the chemical constitution of the attracting molecules.

The paper is mathematical and not suitable for abstraction. It will appear in the *Journal of Physical Chemistry*.

Bromination of Heptane under Pressure: ALVIN SAWYER WHEELER.

As the best yield of β-heptyl bromide gotten by Venable was only 30 per cent. of the theory, an attempt was made to increase it by conducting the bromination under pressure. The reflux condenser was attached to a jar filled with solid potash to absorb the hydrobromic acid. To the further end of the jar was attached a tube extending 190 mm. under mercury. The bromine was forced into the reaction flask by air pressure. The yield of β-heptyl bromide was not increased. However, the yield was increased to 36 per cent. by using an excess of bromine, the higher bromination products also increasing and the unchanged heptane decreasing considerably. But this experiment was carried out at atmospheric pressure.

Notes on the Occurrence of Cobalt in Wake County, North Carolina: S. E. ASBURY.

Action of Chloral Upon the Nitranilins: ALVIN SAWYER WHEELER and H. R. WELLER.

The work done by Baskerville and Eibner, independently, upon the condensation of chloral with para-nitranilin was extended to the ortho- and meta-nitranilins. The reactions are readily carried out in benzol. Two molecules of a nitranilin condense with one molecule of chloral to form a trichlormethylendi-nitrophenylamine. They are all beautiful crystalline substances. The para and ortho bodies are very stable while the meta is easily decomposed. By working in the cold, additional products may be formed first.

The Determination of Starch in Baking Powders: W. M. Allen.

Arsenic Pentachloride: Chas. Baskerville and H. H. Bennett.

Penta-halogen compounds of arsenic in which one or more chlorine atoms have been replaced by organic radicals are well known. Sloan (*Chemical News*, 46, 194) prepared AsI_5 and Marignac obtained AsF_5. Many workers have failed to prepare $AsCl_5$—although Sloan (*Chemical News*, 42, 180) produced a body answering to the formula As_2Cl_8 stable at 15° C., having saturated the trichloride with chlorine at —23°. The authors prepared $AsCl_5$ by following out the same procedure at the temperature of solid carbon dioxide. The greenish-yellow liquid was stable up to —28° C.; readily lost chlorine with elevation of temperature; dissolved in carbon disulphide and absolute ether cooled to —30°, crystallizing from the latter on lowering the temperature a few degrees.

Preparation of Pure Præseodymium Compounds: Chas. Baskerville and J. W. Turrentine.

The beautiful but tedious and time-consuming method of Carl Auer, who split didymium into neo- and præseodymium, has been followed with alterations in detail by the subsequent workers, viz., von Scheele, Brauner, Dennis and most recently H. C. Jones. The method depends upon prolonged fractional crystallization of a water solution of the double præseodymium ammonium nitrate acidified with nitric acid. This paper gives an account of a partial repetition of that process, some unsuccessful efforts to improve upon it, and finally a method giving very satisfactory results.

Experiments seeking the separation by fusion with sodium peroxide, potassium disulphate; precipitation by potassium chromate (Muthman) and iodate (Gibbs) and formaldehyde, gave negative results or observations were made not sufficiently encouraging to warrant further pursuit.

The final method depended upon saturating a cold concentrated citric acid solution with fairly pure præseodymium hydroxide, free from ammonia and excess of water. This solution when filtered and heated precipitated a beautiful green citrate, which is insoluble in boiling water, being rapidly washed by the same in a hot funnel until free from acid. Neodymium and lanthanum citrates do not act this way. The purity of the body was determined with a large Rowland grating by Dr. W. J. Humphreys, who made the examinations of the materials used by Jones.

The Sulphur Contents of Some Vegetable Materials: W. A. Withers and G. S. Fraps.

As the average of a number of analyses, we find the ash of plants to contain only a portion of the total sulphur, as follows: cottonseed meal, one-sixth; cottonseed hulls, one-fifth; oats, one-tenth; cowpeas, one-sixth; corn, one-fortieth; peanuts, one-third; tobacco, four-fifths. Plants contain much more sulphur than has generally been considered to be the case. Corn and oats contain more sulphur (as SO_3) than potash, soda, lime or magnesia. It is probable that sulphur plays a greater role in plant nutrition than has been suspected.

Methods of Determining Sulphur in Plants: G. S. Fraps.

The paper is an account of a study of several methods. Evaporation with nitric acid and subsequent ignition with the addition of calcium acetate seems to be the best method.

Determination of Sulphuric Acid in Soils: C. B. Williams (See *Jour. Am. Chem. Soc.*, Vol. XXIV., p. 658–661).

The Deportment of Pure Thorium and Allied Elements with Organic Bases: CHAS. BASKERVILLE and F. H. LEMLY.

Miss Jefferson (Doctorate Dissertation, University of Penn., 1901) used acid-free pure nitrate in her study of the effect of certain organic bases on thorium salts. This work was repeated, verified and new observations made, namely, in certain cases (phenyl-hydrazine for example) two distinct precipitates were obtained which, mixed, corresponded with the results cited. The work was extended by the use of other bases, including many alkaloids. The accepted pure thorium nitrate, sulphate, and oxychloride were tested side by side with Baskerville's repurified tetra-chloride (*Journ. Am. Ch. Soc.*, 23, 761, 1901), and the volatile chloride (Weisser dampf of Berzelius, *Pog. Am.*, 119–155, 1863). All solutions were of known strength. The sulphate was found to be most readily precipitated by organic bases and good qualitative reactions verifying former work on the complexity of thorium were obtained.

Rediscovery of a Process for Rendering Phosphoric Acid Available: CHAS. BASKERVILLE.

In endeavoring to secure a mechanical method for concentrating phosphatic pebble overlaying the Eocene marl of the coastal plain region of North Carolina (Castle Haynes Mines) the concentric structure of many of the nodules was redetermined (Penrose, Bull. U. S. Geol. Survey, 46, 71). A number of analyses of carefully selected pebbles were made and in no case, except with the fossil teeth, which occur in the deposit to a greater or less extent, could samples be had which contained less than fifteen or twenty per cent. each of silica and limestone.

The chemical methods for increasing the content of phosphate were unsuccessful from an economic point of view. Jigged material could be had which contained from 35 to 44 per cent. of tricalcium phosphate, so methods of fusing with substances like alkaline sulphates, sulphides, nitrates and finally carbonates were tried. The last was thoroughly successful, the nitrates giving the largest percentage of citrate soluble phosphoric acid, but the expensive nitrogen was driven off. Knoop (*Bied. Centr.*, B. 28, 576) heated phosphates, bones, etc., with alkaline silicates and obtained a 99-per-cent. yield of 'available phosphoric acid.'

G. A. Liebig (U. S. Patent 241,868, 1881) heated the same materials with carbon and Wiborgh (U. S. Patent 601,089, 1898) secured the American rights for a process the same as the author's, having preceded him by a few months. The process is of value in those countries where chamber acid is dear (Sweden) and large deposits similar to the North Carolina carbonaceous and silicious phosphates are found as recently noted in Japan. (SCIENCE, X., 900.)

A Bath for Hot Precipitations: CHAS. BASKERVILLE.

A spiral of block tin passes through a tall copper bath arranged to promote a constant flow of hot oil. The clear solution enters at the top and drops from the bottom precipitated into a heated filtering apparatus. The suggestion was made to the author by Dr. H. S. Carbeth, of Cornell University. Drawing shown.

A Platinum Air Bath: CHAS. BASKERVILLE.

A drawing was shown of this bath, used by the designer in atomic weight work, according to the method of G. Krüss.

Black Rain in North Carolina: CHAS. BASKERVILLE and H. R. WELLER.

'The famous black rain,' so-called by natives, fell at Louisburg, N. C.

A sample (through the kindness of Professor M. S. Davis, of the Louisburg Female College) came into the hands of the au-

thors, who made an analysis of the water. No especial phenomena were noted preceding or during the precipitation 'except an unusually black cloud and a heavy downpour of rain, accompanied by a darkness so dense as to necessitate the use of lamps for half an hour.' About sixty per cent. of the total residue (88 parts per million) was organic matter, largely soot. The chlorine content (19.144 parts per million) showed an unusual amount of sodium chloride. The residue contained traces of several metals, as calcium, iron, manganese, zinc and aluminum. The other constituents indicated ordinary rain. The situation and amount of fuel burned in the place, as well as the time of year, preclude accounting for the fluorescent black rain by local contamination such as observed in numerous cases by Augus Smith and Phipson and lately by Irwin, who examined the snowfall in Manchester (*J. S. C. In.*, 21, 533). While it is well known that unusual impurities in rain, snow, etc., often occur and the sources of contamination may be traced great distances, no opinion is hazarded as to the cause of this phenomenon. All such incidental observations deserve chronicling as did the 'blood rain' reported (by Passerini) to have fallen at Florence in March of last year (*L'Orosi*, 24, 325) and the 'dust fall' in Europe the same month (reported by Hellmann and Meinardus).

C. B. Williams,
Secretary.

BLUE FOX TRAPPING ON THE PRIBILOF ISLANDS.

Science for January 26, 1900, contained an account of the method of trapping blue foxes employed on St. George Island of the Pribilof group and of the efforts, there and elsewhere, to render the blue fox polygamous by killing males only. Near the end of the article it was said 'The outcome of these experiments will be awaited with much interest, and if by a little artificial selection and environment a naturally monogamous animal can be rendered polygamous, the supply of blue fox furs will be materially increased.'

The experiment has been continued and, by the courtesy of the Treasury Department, some of the results are here given. From the fact that for the last four seasons all females taken in the traps have been released it might naturally be expected that there should now be a marked preponderance in the number of females. That such is not the case, however, is shown by the fact that during the trapping season of 1900–1901 there were taken 614 males and but 690 females, an excess of only 80 after four years of killing males only. A glance at the subjoined table giving the results of each year's trapping shows that not only has there been no increase in the proportion of females to males, but that in one year the number of males taken actually exceeded that of the females by 89.

Number of Foxes Taken on St. George Island.

	Males.	Females.	Total.	Excess of Females.
1897,	102	324	426	222
1898–9,	478	389	867	—89
1899–00,	468	487	955	19
1900–02,	614	690	1304	76

At first sight it might appear that there had been a noteworthy increase in the total number of foxes, but a large portion of this apparent gain is due to the effort that has been made to ascertain the number of foxes on St. George, and in the spring of 1901 trapping was carried on both at the 'fox house' and in other places after the close of the regular season. All these animals were marked and released, so that no fox was counted twice. That there has been some slight gain in the number of foxes seems probable, but a glance at the

table reveals the curious fact that the proportionate number of females has not increased.

The present system of trapping on St. George, under which all females were spared, was commenced by Agent Judge during the season of 1897–8. In that season 324 females and 102 males were branded and released. Undoubtedly there were more foxes on the island during that time than those which had been through the trap, but taking the foregoing figures as a basis, giving an increase of only two pups each year for every female, to allow for females which did not bear young, and releasing one male for every four trapped, we should have for the succeeding years the following results, presuming that the sexes are born in equal proportions, viz.,

Year.	Males.	Females.
1897–8,	102	324
1898–9,	106	648
1899–00,	188	1,296
1900–01,	371	2,592

thus showing that in four years the proportion of the sexes, in theory at least, ought to bear the relation to each other of one to seven, which it is believed is not sufficient to serve the purposes of breeding.

The rate of increase estimated for each breeding female in the above table is absurdly small. Litters of foxes have been stated by the natives to have been found having as many as twelve or thirteen young ones. But even at this small rate, it will be seen that there should be over 2,000 breeding females on the island at the close of the trapping season of 1900–01. The trapping last season, however, has shown that but 690 females were found on the island after months of trapping, and that the number of females was but little in excess of that of the males.

The experiment of the Semidi Propagating Company has been similar to that obtained on St. George. This company, about fifteen years ago leased the Semidi Islands and, obtaining several pairs of blue foxes from the Pribilof Islands, began operations. The foxes have been fed and cared for, all the females released, and a certain proportion of males, at first one male to seven females, and, later on, a larger proportion. But in spite of this the foxes on the Semidi Islands have not increased as was anticipated, their numbers being far below what they theoretically should be.

What becomes of the females released each year, and their natural increase, is a question. Some, of course, die of old age and disease. There is a possibility, too, that some few are carried away on the ice when the latter surrounds the island, but as natural infirmity and ice are agents which may be supposed to operate on both sexes alike, it will be hard to believe that proportionately they cause the loss of more females than males. It is more probable that the increase even at the rate mentioned did not occur. If not, the only explanation is that all females on the island did not bear young and that a considerable percentage of the young that were born did not reach maturity.

The reason why all the young do not reach maturity is probably that in some instances the extreme young are eaten by the adults. There also may be present on the islands the same cause which resulted in the death, in the National Zoological Park, where several pairs were deposited by the Semidi Company for experimental purposes, of the only litter of blue foxes born there that attained any growth whatever, namely, *Uncinaria*. It would seem that the provision, as far as possible, of a male consort for every breed-female, would in large measure provide against the eating of the young, if we are to believe that the male is instrumental in

providing food for the female. But the reason why there is apparently not the least increase in the number of females remains to be shown.

A different problem seems to be presented by the conditions found on St. Paul, thirty miles distant from St. George.

On St. Paul efforts were made by Mr. Judge last winter to localize the foxes by exposing seal carcasses as food in the stable at Northeast Point and at the watch-house at Half-way Point. His efforts, however, were not successful in bringing together foxes in any number sufficient to justify the adoption of the trapping methods used on St. George. The old method of trapping with steel traps, therefore, was resorted to, the killing being restricted to about two weeks' actual trapping. This catch amounted to 153 blues and 1 white.

The trapping on St. Paul disclosed the presence of about a dozen pelts of very inferior quality. Nearly all of these skins were taken on the reef adjacent to the village. This ground has always rendered a poor grade of skins, but this year the belief is that those skins are poorer than ever before.

So far no means have been arrived at which will assure the perpetuation of the species on St. Paul Island. In former years it was the practice to take foxes only on alternate years on St. Paul Island, the intervening year being closed to trapping. The numbers still decreasing, it was thought wise during the last two seasons to trap during a limited time each season, proceeding on the theory that, owing to the fewer number of seals taken, the food supply on the island was insufficient to provide for a larger number of foxes, and that it was better to trap the surplus than to allow it to die of starvation.

The food supply on the island last winter, however, was more than was necessary to support the fox herd, owing to the large number of dead arries cast up on its shores. The carcasses of these birds, Agent Judge states, were found in numbers uneaten the following spring. This unusual food supply undoubtedly served to defeat the efforts made to localize the foxes by artificial feeding, and to trap them in house traps. It may be, if these efforts are continued the winter of 1901–02, that better results will follow, but, unless some improved method of fox trapping or fox culture is devised for St. Paul, the practical extermination of the species on that island is threatened.

Walter I. Lembkey,
F. A. Lucas.

SCIENTIFIC BOOKS.

RECENT BOOKS ON HYGIENE.

Principles of Sanitary Science and the Public Health. By William T. Sedgwick, Ph.D. 1st edition. New York, The Macmillan Company. 1902. 8mo. Pp. 368. Price, $3.00.

Water Supply (considered principally from a sanitary standpoint). By William P. Mason. 3d edition. New York, John Wiley & Sons. Pp. 448.

Bacteriological Examination of Water. By W. H. Horrocks, M.B.B.Sc., London, Assistant Professor of Military Hygiene in the Army Medical School, Netley. London, J. & A. Churchill; Philadelphia, P. Blakiston's Son & Co. 1901. Pp. 300.

Municipal Engineering and Sanitation. By M. M. Baker, Ph.B., C.E., Associate Editor of *Engineering News.* 1st edition. New York, The Macmillan Company. 1902. The Citizen's Library. 12mo. Pp. 318. Price, $1.25.

Sewage and the Bacterial Purification of Sewage. By Samuel Rideal, D.Sc. (London). New York, John Wiley & Sons. 1901. 8vo. Pp. 316. Price, $3.50.

Whatever Professor Sedgwick may write will always be read with pleasure and profit,

and his recent volume on the 'Principles of Sanitary Science and Public Health,' with special reference to the causation and prevention of infectious diseases, will be received with intense satisfaction by students of this subject. He has been the biologist to the State Board of Health of Massachusetts and also professor of sanitary science and the public health in the Massachusetts Institute of Technology for a number of years, and his opinions are, therefore, entitled to great weight. His work is as clear and accurate as his lectures, and it is well for mankind that his teachings are now accessible to a larger number of students, especially as we thoroughly endorse his quotation from Lord Derby that 'sanitary instruction is even more important than sanitary legislation.' The work is divided in three parts. Part I. deals with 'Health and Disease'; Chapter 1, on health, old age and disease—a classification of diseases according to their place of origin; Chapter 2, on the causes of disease, ancient and modern theories; the zymotic or germ theory of infectious disease; Chapter 3, on the rise and influence of bacteriology; transformation of the zymotic into the zymotoxic theory of infectious disease; and Chapter 4, on the sanitary aspects of the struggle for existence; parasitism, health and disease in terms of general biology, vital resistance, susceptibility and immunity. These chapters are written in a masterly style and are pregnant with facts clearly and concisely presented. We are pleased that among the theories of the eighteenth century regarding the causes of disease, Hahnemann's pretensions receive attention in a quotation from the 'Encyclopædia Britannica,' 9th edition, Vol. XII., pp. 126–129: "Hahnemann taught that disease is to be regarded as consisting especially of the symptoms of it as experienced and expressed by the patient or as detected by the physician; in other words that the chief symptoms or the 'totality of the symptoms' constitute the disease, and that disease is in no case caused by any material substance, but is only and always a peculiar, virtual, dynamic derangement of the health. "Diseases (introduction to the 'Organon,' p. 17) will not cease to be spiritual dynamic derangements of our spiritual vital principle." In all countries the doctrine of homeopathy is still without broad scientific recognition. * * * Modern medicine is doing some of its best work in showing the material and the visible character of the causes of many of the commonest diseases and suggests this in many cases where it has not yet been demonstrated. The cause of many diseases is shown to be a living germ, or particle, which can be discerned under the microscope, can be carried on a lancet or in a tube and inserted under the skin so as to produce its peculiar disease. * * * The causes of other diseases are often not merely visible under the microscope, but coarsely visible. * * * The lead which paralyzes the painter's wrist is not a 'spiritual' thing. It is an accumulation of matter in the wrong place and enters his body in palpable quantities, and, what is more, can be recovered in similar quantities from his body. So with uric acid or its salts in the blood of a person who has inherited his father's gout, and perhaps his port wine. It is not a 'spiritual' affair at all, but can be demonstrated chemically and under the microscope. The itch to whose mysterious workings Hahnemann attributed two thirds of the internal diseases of the body, including mania, cancer, gout, etc., is easily demonstrated to be dependent on an ugly crab-like insect, which can be destroyed in a few hours with sulphur, when there is an end both of it and of the itch." In spite of the rotten foundation of Hahnemann's teachings, a monument has been erected to him which occupies one of the most conspicuous sites in the national capital.

We like our author's paragraph wherein he says: "If diseases due to defects or flaws in the vital machinery are to be avoided, this is obviously to be done only by improving and perfecting the apparatus, which is a comparatively slow and difficult matter. To make a family of weak constitution strong is to reconstitute its entire physical basis, and if this can be done at all, it may be only after generations shall have come and gone. It must be done by careful living and good feeding, wise intermarriage and severe natural selec-

tion. Sanitation alone cannot hope to effect these changes. Diseases which arise from some invasion of the organism may possibly be warded off. As they virtually proceed from the environment which, in theory at least, is under our control, they may be prevented. With such diseases the sanitary science of to-day is chiefly concerned.

"Sanitation has stamped out smallpox in many civilized communities. It is seeking to-day with more or less success to do away with typhoid fever. It boldly attacks epidemics of diphtheria and scarlet fever and has recently sought to control tuberculosis and malaria. There can be no question that it has already won signal victories, and that its practitioners may reasonably hope for fresh laurels in the near future."

As a matter of fact the achievements of sanitation have been modestly stated, when we consider that the mortality from typhoid fever, diarrhœal diseases and consumption has been reduced during the fifty years fully one half, and that the reduction in the mortality from croup and diphtheria in the United States during the past ten years alone amounts to over 52 per cent. Indeed when the methods of prevention recommended by sanitarians are generally adopted many of these diseases will be reduced to a minimum and probably eradicated in the course of a few years. So, for example, in December, 1900, the propagation of yellow fever by mosquitoes was discovered by Surgeon Walter Reed and his colaborers of the United States Army, and the practical value of this discovery, which in point of importance ranks only second with Jenner's discovery of vaccination, has been proved by the complete eradication of this scourge from Havana. We learn from Surgeon W. C. Gorgas, Chief Sanitary Officer of Havana, that in 1900, though the general sanitary condition had immensely improved, yellow fever was still present, amounting to 1,400 cases with 300 deaths, and he felt discouraged at the little progress made. After Reed demonstrated that the mosquito can be infected only during the first three days of the disease and that there is a period of from twelve to fifteen days when the bite of the stegomya can convey the disease, Dr. Gorgas, in February, 1901, reorganized the sanitary department and turned its attention to the local conditions and their relation to the spread and development of the mosquito. The rain barrels, the family cistern, all breeding the stegomya, the Chinese gardens from which came anopheles, were studied and 150 men were put to work to destroy the breeding places by drainage and the addition of kerosene oil to the stagnant water, and the mosquitoes themselves were killed by fumigation and pyrethrum powder. In January, 1901, the city was free from yellow fever, in July the suburbs received a certain amount of reinfection, but on September 28, 1901, the last case of yellow fever occurred. Since that time the land has been practically free, since Havana has been the center of infection. Dr. Gorgas has shown what organized scientific efforts can accomplish in the eradication of disease germs and their carriers, and it is to be hoped that the present government will maintain the same vigilance and radical precautions. There can be no half-way measures. The sanitary history of Havana is one of the most brilliant chapters in American sanitation and augurs well for the twentieth century. What has the Government done to reward the labors of Reed, Carroll, Agramento and Lazear? or for that brave young soldier Kissinger, from Ohio, who, on December 5, 1900, was the first to volunteer to be bitten by infected mosquitoes, with the only proviso that he should receive no pecuniary reward, but as he expressed it 'solely in the interest of humanity and the cause of science.' Such exhibition of moral courage as well expressed by Doctor Reed has never been surpassed in the annals of the Army of the United States, and, we will add, could never have been inspired except by a man of Dr. Reed's stamp.

Part II. of Professor Sedgwick's work deals with infection and contagion, their dissemination and control and fundamental problems of public sanitation, and contains ten chapters. His selections on man and other animals and their excreta, as sources and prime movers of infection, on dirt and disease and the philosophy of cleanness are presented in an original and effective manner, as are also

chapters on sewage and water supplies and ice. He very properly emphasizes the important services rendered by the State Board of Health of Massachusetts in solving some of the problems involved in the purification of sewage by land treatment or intermittent filtration, and the purification of water by slow sand filtration. His description of the latter process is very simple and clear, and while the process is nearly, if not exactly, the same as in the purifying of surface waters which pass through earth and become ground waters, we believe that properly constructed filter beds are an improvement on nature as there will be no geological flaws which permit the passage of disease germs. We cannot subscribe entirely to the author's views expressed on p. 239, regarding artificial processes of purification of water supplies, especially the process known in America as mechanical filtration, and especially his paragraph on page 240 relating to the hygienic efficiency of rapid mechanical filters. The importance of the subject demands a full presentation of the comparative efficiency of the natural, or slow, and the rapid mechanical filters. Perhaps the most recent and exhaustive discussion of this subject will be found in Senate Document 1901, 'Purification of Washington water supply,' edited and compiled by Charles Moore, Clerk of the Senate Committee on the District of Columbia. On page 195, a Committee of the Medical Society states that the most important aspect from which the two methods of filtration shall be compared is in their relation to public health and more particularly in relation to what they have accomplished in the reduction of typhoid fever mortality in cities where they have been employed. Viewed from this standpoint, it appears that the mechanical filters, as first pointed out by Mr. Hill, have accomplished relatively very little in the reduction of typhoid fever death rates. In a subjoined table five American cities using the mechanical devices are compared with five cities in Europe using water from sand filters, with an average for the year 1895 for the American cities of 46.8 typhoid fever deaths per 100,000 of the population against 6 deaths per 100,000 for the foreign cities; that is to say, the American rate was almost eight times as great as the foreign rate. Lest this comparison between foreign and domestic cities be considered unfair, another table was presented showing the average number of deaths from typhoid fever in several American cities before and after filtration. This table shows that while sand filters accomplish a reduction of 78.5 per cent. in the number of deaths from typhoid fever, the establishment and use of mechanical filters have coincided with an increase of 20.43 per cent., and even if the statistics from Elmira, Lexington and Newcastle, where an increase was noted, are eliminated, the reduction of typhoid fever in consequence of mechanical filtration amounts to only 26 per cent., as compared with 78.5 by the process of slow sand filtration. We believe that even the more recent experiments at Pittsburgh quoted by Sedgwick and Mason as indicative of hygienic efficiency of the mechanical filters, show the inferiority of this system as compared with the sand filter.

EXPERIENCE OF SIX MONTHS AT PITTSBURGH, PA.

	Bacteria in Raw Water per Cubic Centimeter.	Percentage of Bacteria Removed.	Number of Bacteria per Cubic Centimeter of Effluent.
Jewell filter	11,531	97.45	294
Warren filter	11,531	98.26	200
Sand filter	11,531	99.09	105

If typhoid germs are proportioned to the colonies of bacteria found in the effluent of a filter, can any one deny that the prevalence of typhoid fever among the users of each of the three waters as deduced from the above figures would be in the proportions of 105, 200 and 294, or nearly 1, 2 and 3, the advantage being in favor of slow sand filtration? From the testimony at hand there appears to be no doubt that sand filtration has given better results than mechanical filtration; the former has been in use since 1839, and is an imitation of nature, whose processes are generally simplicity and perfection, while the latter requires mechanical devices and is still an experiment from the hygienic standpoint, that is, as bearing on the prevalence of ty-

phoid fever, and requires, moreover, the addition of alum. It is the alum, not the filtration, which is actively concerned in the removal of the bacteria. If enough alum is added the effluent is clear and gives satisfactory results on bacteriological examination. If an insufficient quantity is added the effluent may be turbid and charged with bacteria. If too much is added or more than can be decomposed by the carbonates present, alum will remain in solution in the effluent as a most undesirable accidental constituent; and finally, the life of an English sand filter is practically unlimited, while that of the mechanical type is as yet undetermined. In view of all these facts, the writer finds no difficulty in unhesitatingly declaring in favor of the natural method of sand filtration, especially as the superiority of this method in the suppression of typhoid fever may be accepted as acknowledged even by the advocates of the mechanical process.

Professor Sedgwick's chapter on ice as a vehicle of infectious disease, the ice supply and the public health, on p. 251, is especially interesting; the more important facts are summarized as follows: "(1) While it is true that some individual bacteria survive exposure to freezing and even very low temperatures, such conditions are highly unfavorable to bacteria in general, even of the same kind, especially if the exposure be prolonged. Water does certainly tend to purify itself, and under ordinary and favorable circumstances does actually and extensively purify itself during freezing. On the other hand, such purification, while great, is usually incomplete. (2) Out of a number of individual bacteria of any kind subjected to freezing, a large proportion usually perish, especially if they continue to be exposed to the low temperature for two or three weeks, but a small proportion survive. (3) There is good reason to believe that the efficiency of the survivors and their virulence are weakened both by their loss of numbers and by freezing or by long exposure to low temperatures. These facts taken together with those already mentioned above enable us to explain all or nearly all the phenomena in question. They also enable us to draw important conclusions concerning the dangers of the pollution of ice and concerning ice supply and the public health."

In the next paragraph he says: "Although from what has now been said it is clear that there is much truth in the popular opinion that water purifies itself in freezing; it is equally plain that too much reliance must not be placed upon this process. Ice should be made only from good raw materials, *i. e.*, from waters which are pure and potable, and this is doubly true if 'artificial' rather than 'natural' ice is to be used for public or private supplies." In view of these difficulties the writer has urged upon his students for years the dangers of mingling of melted or cracked ice with food and drink, for apart from the possibility of infected ice he is convinced that many of the digestive derangements so common in this country are induced by the low temperatures of food and drink. A temperature of between 50° and 60° F. is sufficiently low to be refreshing, and for this purpose he recommends that the bottles containing the filtered or boiled water and other articles of food be set on ice or placed in a cold storage."

Chapter XI., on milk as a vehicle of infectious disease, is also extremely valuable and must be read to be thoroughly appreciated. The importance of this article of food in relation to public health has been thoroughly studied; the present writer continued the investigations made by Mr. Ernest Hart in 1881 and presented his conclusions, based upon the tabulated histories of 330 outbreaks of infectious diseases spread through the milk supply, before the International Medical Congress at Paris in 1900; these outbreaks consist of 195 epidemics of typhoid fever, 99 epidemics of scarlet fever and 36 epidemics of diphtheria. On page 284 the author says: "One of the most startling discoveries recently made in regard to infectious materials in milk is that of Dr. Stokes and an associate, of Baltimore, who investigated a curious creamy yellowish layer of a slightly suspicious appearance upon milk derived from a dairy tributary to that city. They found that the yellow layer was largely composed of pus and finally traced its origin to a herd affected

with garget." The writer in his article on morbific and infectious milk, Report of Health Officer of the District of Columbia, 1895, referred to Professor Brown's observation published in the *Transactions* of the Epidem. Society of London, Vol. VIII., 1888–1889, p. 34, who, in speaking of a communicable udder disease of the cow, said: "Whatever the disease really might be, it was at least certain that the milk of cows suffering from it was contaminated with pus and other morbid products which might very well be responsible for human disease. * * * The condition of the milk can be judged best from the remark of a dairy boy, who said: 'They could not drink the milk themselves and had sent it to London, but they hoped the poor people there would not suffer.'" Indeed, D. J. Fagan described, in the *British Medical Journal,* Vol. II., 1869, p. 489, a case of pseudo-membranous stomatitis produced by the milk of a cow with inflamed udder, and after, Guillebeau, Adametz, Mace and Hueppe found several pus-producing organisms in the milk of cows suffering from garget, the writer in the paper already referred to felt warranted in declaring that in all the epidemics of scarlet fever and diphtheria which were traced to milk from cows suffering with some inflammatory lesions of the udder, we have typical instances of a streptococcus and staphylococcus infection, and Grey Edwards, in August, 1897, published cases of follicular tonsilitis in which these organisms were not only found in the suspected milk and in the milk of a certain animal, but also in the culture from the throat. We quite agree with the author that the outlook for improved milk supplies, in consequence of wholesome agitation and public demand, is very encouraging.

Chapter XII. on certain uncooked foods, meats, oysters, fruits, vegetables, etc., as vehicles of infectious disease and the sanitary significance of cooking is likewise of great importance, as are the chapters on the prevention and inhibition of infection and disinfection, and disinfectants.

Part III. deals with some popular beliefs as to certain special and peculiar causes of disease, and 'dwells briefly upon some of the more widespread of the fallacious notions or half-truths of sanitary science, and defines explicitly the present attitude of the best opinions of the time in regard to certain subjects relating to the public health commonly misunderstood or misinterpreted.' Among the topics discussed are the belief in dangers from sewer gas, which he regards as very much exaggerated, though he freely grants the possible efficiency of sewer gas as a general poison and depressant. The writer, however, disapproves of the presentation of the subject matter in relation to wells, even at the risk of being classed among the pseudo-sanitarians; he feels disposed to regard most wells with grave suspicion, for the simple reason that family wells and privies are, alas, too often dangerous neighbors. This comparatively novel point of view has been forced upon us by the numerous outbreaks of typhoid fever spread through polluted wells. We also know that typhoid fever is far more common in the country than in cities, and as a result of a general introduction of a common supply in the country towns of Massachusetts in place of that derived from individual wells, a very decided decline in typhoid fever has been noticed.

Again, the typhoid fever death rate at Munich at a time when that city was riddled with cesspools and wells, was 210 per 100,000 of population; with the introduction of sewers and a pure water supply, the rate has fallen to 3 per 100,000.

Professor Sedgwick evidently has the utmost confidence in the filtering powers of the earth, and deems it very unlikely that disease germs survive in or pass even a few feet through soil beyond a leaky cesspool. We fully agree with him that the dangers of infection from the top of the well have not been sufficiently emphasized; on the other hand, Drs. Abba, Orlandi and Rondelli, who experimented on the filtration capacity of the soil about the filter galleries of the Turin water supply, found that cultures of *Micrococcus prodigiosus* poured with large volumes of liquid into the ground at various points made their appearance 200 meters away in 42

hours, and 27.5 meters away in 7 hours;* showing what we started out to say, that the soil cannot be depended upon to hold back all the organisms from wells, and certainly not when in dangerous proximity to barnyards and privies; moreover, the above typhoid fever statistics appear to fully warrant this conclusion. As regards the belief in dangers from damp cellars, the writer is of the opinion that this fear on the part of the more intelligent of the human race is well founded. Damp cellars usually mean damp walls and dampness of the air of the house; this not only leads to undue abstraction of animal heat and lowers the vitality of the inmates, but also influences the cutaneous functions and favors the development of catarrhal and rheumatic affections, and a bronchial catarrh thus produced renders the mucosa vulnerable to the invasion of tubercle bacillus. This would appear to explain the undue prevalence of consumption in some of the damp prisons, the relation between dampness of soils and consumption, as first pointed out by Bowditch and Buchanan, and the good effects of drainage in the reduction of consumption. In spite of these differences of opinion, we predict that Professor Sedgwick's hope that his book may find a useful place in sanitary education, both professional and popular, will be fully realized.

Professor Mason's book on 'Water Supply' has reached the third edition since 1896, and is well and favorably known. The book is divided into eleven chapters, dealing with the history of water supplies, drinking water and disease, artificial purification of water, natural purification of water, rain, ice and snow, river and stream water, stored water, ground water, deep-seated water, quantity of per capita daily supply, action of water upon metals. The appendix deals with analysis of city water supplies, typhoid fever death rates for American and European cities, effects of contaminated water upon fish, use of sea water for street washing, sewer flushing, etc. It is an excellent work from a sanitary standpoint, and will continue to enjoy its present popularity. The chapters on the 'chemical and bacteriological examination of water' have been omitted from the present edition, as they have been published in a separate book for the more convenient use of students.

Professor Horrock's book, an introduction to the bacteriological examination of water, will be a welcome addition to the working library of the sanitarian. While assuming a knowledge of elementary bacteriology, the author in Chapter I. gives directions for the collection of samples, followed in Chapter II. by the method pursued in qualitative bacteriological analyses and the preparation of water plates. The next chapter deals with multiplication of the water microorganisms, the influence of light, rest and movement, sedimentation, chemical conditions upon the duration of bacterial life, and the action of electricity on bacteria. Chapter IV. considers the bacterial contents of snow, ice, hail and rain, and of waters from rivers, lakes, wells and springs. We quite agree with him and Mace that the number of microorganisms present does not give any accurate information as to the value of a water, for it is after all the character of the germs which concerns us most, at the same time Mace suggests the following classification, based upon a long series of examinations:

				Microorganisms per c.c.	
Very good	water	contains	from	0–	50
Good	"	"	"	50–	500
Mediocre	"	"	"	500–	3,000
Bad	"	"	"	3,000–	10,000
Very bad	"	"	"	10,000–	100,000

Chapter V. contains a very satisfactory presentation of the action of sand filters in the elimination of bacteria, which he considers, like most authors, as partly mechanical and partly vital.

Chapters VI. to XV. are devoted to the qualitative bacteriological analyses of water and constitute the most valuable part of the book to the student. Chapter XV. describes the mode of action and utility of the Pasteur, Chamberland and Berkefeld filters and the methods of testing water filters, and the final chapter gives a summary of the procedure recommended for the bacteriological examination of water and preparation of nutrient media.

* *Zeitschrift f. Hyg.*, Vol. XX., p. 66; see also Professor Pfuhl's experiments in the same journal for 1897, p. 549.

Mr. Baker's book on 'Municipal Engineering and Sanitation' is one of the series of the Citizen's Library published by the Macmillan Company, and is 'intended for that large and rapidly growing class of persons who, either as officials or as citizens, are striving to improve municipal conditions.' For this purpose the book cannot be too highly recommended, and if generally read cannot fail to exercise a powerful influence for good in sanitation, as it will stimulate an interest and educate the public in the various and important questions of municipal hygiene. The book is divided into five parts with 43 chapters. Part I. deals with the city and its needs, ways and means of communication, including streets, pavements and sidewalks, subways, grade crossings, urban and interurban transportation, bridges, docks, telegraph, telephone and messenger service.

Part II. treats of water supplies, water purification, water consumption and waste, pure ice, milk, markets and slaughter houses, municipal office buildings, light, heat and power. Part III. contains chapters on sewerage and drainage, sewage disposal, street cleaning, collection and disposal of refuse, cemeteries and crematories.

We like the text and the whole tone of the book; here is a sample: "One reason for the unsatisfactory state of garbage disposal in the United States is the failure to recognize that the problem is a technical one, demanding a high grade of engineering knowledge for its solution. Most cities intrust the study of the garbage question to some council or committee possessed with no previous knowledge of the subject and with no training which fits its members to gather and weigh information. Such committees generally take a more or less extended tour of inspection of garbage plants in other cities, where they are very likely to be met by commercial agents of the various systems in use; the outcome often is that the agent who can make the most favorable impression on the committee, by talk, wine and theaters, has the pleasure and possible profit of having his system adopted. Rightly conducted these trips may prove instructive and valuable, but, hurried and superficial as they usually are, they are likely to give false impressions. They should always be supplemented by competent engineering advice. The latter might be obtained in the first instance with less expense and more certainty of sound conclusions than is likely to be the result of an investigating trip by three to ten laymen."

Part IV. deals with protection of life, health and property, and contains chapters on fire protection, building and plumbing regulations, electrolysis of underground pipes, smoke abatement, suppression of noises, disinfection, prevention of water pollution, public baths and wash houses, public lavatories and water-closets, municipal dwellings and lodging houses, municipal parks, playgrounds and gymnasiums. These chapters are of special interest to the general reader. We are told by the author that the cities of Europe and Japan are far in advance of American municipalities in the provision which they have made for public baths. The city of Tokio is said to contain one thousand such establishments.

In the United States at the close of 1900 not more than a dozen cities had provided themselves with all-the-year-round baths. It is sometimes urged that in this country there is much less need of public baths than abroad on account of the greater prevalence of bath rooms in private homes, and in connection with philanthropic organizations, but the fallacy of this argument is apparent by the statistics collected by the United States Department of Labor, which show the percentages of the families in four of our largest cities who had no bath rooms, Baltimore 98 per cent., Chicago 97 per cent., New York 97 per cent., Philadelphia, 83 per cent. A similar plea is made for public lavatories and water-closets, which are lamentably deficient in American cities, and often compel recourse to saloons. The chapter on municipal dwellings and lodging houses contains food for reflection. The author says: "An exhibit in the year 1900 by the Tenement House Committee of the New York Charity Organization Society made apparent the fact that there is no place in the world where the decent poor have so poor a chance to live decently as in New York.

Other American cities are also afflicted with overcrowding. More yet are cursed with dwellings that are unsanitary in other respects. It is well known that the death rate in all such buildings, poorly ventilated, with deficient water supply and defective plumbing, is abnormally high. The death rate is but a partial index of the harm done by overcrowding, for the results are moral as well as physical and there is no death like the death of virtue. Where large fractions of the population are packed together under such conditions that personal cleanliness, modesty and decency, and even sexual morality, are practically impossible, the problem is one whose speedy solution demands the attention of the moralist and the philanthropist, as well as the sanitarian." The author makes a strong plea for model tenements at reasonable rentals, and Chapter XXXII. sets forth the necessities and advantages of municipal parks, playgrounds and gymnasiums, all of which will find a sympathetic response in the hearts and minds of those who have the welfare of the human race at heart. Part V. deals with administration, finance and public policy, including city charters, municipal experts, the department of public works, the work of the board of health, municipal franchises, ownership and expansion and many kindred subjects.

Dr. Rideal's first edition on sewage and the bacteriological purification of sewage appeared in May, 1900, and enjoyed such a rapid sale in England and America that a second edition was called for in June, 1901. The work is divided into twelve chapters, and is of intense interest to the engineer and sanitarian. The introductory chapter deals with the characters of sewage and primary methods of disposal, committal to earth, cremation, cesspools, sewers, scavenging, conservancy systems, infiltration, official regulations, water-closet system, dilution in rivers, tidal discharge. In this chapter will be found a historical résumé of the subject of sewage disposal. In speaking of the location of privies and middens, he refers to the danger of wells, springs and rivers from infiltration and points out a number of cases where such pollution took place; in one instance the contaminating influence was about a half a mile distant. He also refers to the reports of the medical officers of health in 1900, notably those of York and Durham, who give statistics showing the connection between outbreaks of typhoid fever and midden privies. He quotes from an address by Sir William Preece before the National Health Society, October, 1899, wherein he referred to the city of Leeds, with a population of 400,000, with a reduction during the twenty years 1875 to 1895 in the death rate from 28 to 18 per 1,000 in consequence of the completion of sewers and the introduction of a better water supply, and continued, 'if this has been accomplished in one city by acting on those principles of applied science, what might be the total number of lives saved throughout the country by the operation of those whose duty it was to carry out the details of the science of sanitation?' The same question may very justly be applied to our own country when we consider that only about 30 per cent. of the population live in sewered towns and 41 per cent. live in towns having public water supplies. During the census year of 1900, there were 35,379 deaths from typhoid fever, which means an annual prevalence of 350,000 cases and a loss to the commonwealth of $185,000,000 per annum from one of the so-called preventable diseases. The undue prevalence of typhoid fever in unsewered towns and suburbs has already been pointed out and explained by the writer in a former review in SCIENCE, November 8, 1901. Chapters 2 and 3 deal with the chemical analyses of sewage and effluents. Chapter 4 with the bacteria in sewage and possibility of the survival of pathogenic organisms. Chapter 5 points out the chemical changes produced by bacteria. Chapter 6 discusses the ultimate disposal of sewage and treats very fully of irrigation and sewage farms. The treatment of sewage by subsidence and chemical precipitation, by heat, chemicals and electricity is disposed of in Chapters 7 and 8. The next three chapters, which are the most important in the book, deal with bacterial purification in a most exact and painstaking manner. On the whole we may conclude that sewage farming will have a very promising future in the West, where

every drop of water is needed for general irrigation. In sections of our country not adapted to farming and where land is scarce, the purification of sewage by intermittent filtration, which requires only about one twentieth the land, has been resorted to, and we are indebted to the splendid experiments made by the Massachusetts State Board of Health, at Lawrence, for much valuable information concerning the efficiency of this system, and which indeed has been adopted by a large number of municipalities both at home and abroad. In communities where land is so scarce that even intermittent filtration is impracticable, a number of processes for the purification of sewage before its discharge into the rivers have been proposed, such as chemical precipitation, sterilization, sedimentation, etc. These processes, however, are now considered as wrong in principle and aiming at the unattainable, and wherever irrigation or intermittent filtration cannot be advantageously carried out, preference should be given to the 'septic or bacterial tank.' This system was devised by Mr. Cameron, of Exeter, England, and is really an elaboration of the old cesspool; the tanks are built of concrete, brick or masonry walls, tightly covered to exclude both light and air, and large enough to contain the flow of sewage from 1,500 to 2,000 persons for from twelve to twenty-four hours. The raw sewage without screening or any preliminary treatment enters by two inlets which are carried down five feet below the surface in order that the entry may be quiet, so as not to disturb the bacterial layers, also that air may not be carried in or any gases escape back to the sewer. After passing through a 'grit chamber' 10 feet deep by 7 feet long and 18 feet wide, the sewage flows over a wall submerged one foot below the surface into the main portion of the tank, which is 65 feet in length, 7 feet 6 inches in depth and 18 feet wide, its capacity being 53,800 gallons, or approximately a day's supply; hence the transit of the sewage is ordinarily very gradual, averaging about 24 hours in the tank, so as to give ample time and quiet for the putrefactive changes which are brought about by the anaerobic bacteria, and which result in the digestion of the suspended organic matter, or its conversion into simpler, soluble forms and gases. The effluent from the tank, brownish-yellow in color and offensive in odor, after being aerated by being run over a weir and cascade arrangement, is next passed over the 'Dibdin bacteria beds' filled with coke breeze and clinkers, where the nitrifying organisms perform their share of the work, until the filtrate is fit to be discharged into the water courses, although whenever practicable it should be previously passed through well-drained land or over water meadows.

The advantage of the tank lies in the reduction in the amount of suspended matter; the accumulation of sludge from the sewage and excreta of 1,500 persons amounted to but four feet at the end of three years' trial; the operating expenses are also very slight and so far the bacterial or septic tank has given the most satisfactory results from a sanitary and economic standpoint, where broad irrigation or sewage farming cannot be applied. Chapter 12 deals with the agricultural value of bacterial effluents and conservation of the valuable constituents of sewage, the classification of trade effluents and the recovery of waste products.

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SCIENTIFIC JOURNALS AND ARTICLES.

THE third (July) number of Volume 3 of the *Transactions of the American Mathematical Society* contains the following papers: 'On the Group defined for any given Field by the Multiplication Table of any given Finite Group,' by L. E. Dickson; "Nachtrag zum Artikel: 'Zur Erklärung der Bogenlänge, u. s. w.,'" by O. Stolz; 'Proof of the Sufficiency of Jacobi's Condition for a Permanent Sign of the Second Variation in the so-called Isoperimetric Problems,' by O. Bolza; 'On Hypercomplex Number Systems,' by H. E. Hawkes; 'On Metabelian Groups,' by W. B. Fite; 'Conjugate Rectilinear Congruences,' by L. P. Eisenhart; 'Constructive Theory of the Unicursal Cubic by Synthetic Methods,' by D. N. Lehmer; 'The Groups of Steiner in Problems of Contact (second paper),' by L. E. Dickson.

The editorial staff of the *Transactions* has been increased by the appointment as assistant editors of Professor James Harkness, Professor E. B. Van Vleck, Professor H. S. White, Dr. C. L. Bouton, Professor L. E. Dickson, Dr. J. I. Hutchinson, and Professor M. B. Porter.

The July number (Vol. 8, No. 10) of the *Bulletin of the American Mathematical Society* contains: 'The First Meeting of the San Francisco Section of the American Mathematical Society,' by E. J. Wilczynski; 'Mathematical Problems, Lecture by D. Hilbert before the Paris Congress of Mathematicians, 1900,' translated by M. W. Newson; 'Reply to Mr. J. L. Coolidge's Review of Hill's Euclid,' by M. J. M. Hill; 'Notes'; 'New Publications'; 'Eleventh Annual List of Papers read before the Society and Subsequently Published'; and a nineteen-page Index of the volume.

The Botanical Gazette for August contains the following articles: J. C. Arthur describes the Uredinæ occurring upon *Phragmites, Spartina* and *Arundinaria* in America, giving full synonymy and specimens examined, describing two new species, and presenting a key; Aven Nelson continues his 'Contributions from the Rocky Mountain Herbarium,' describing numerous new species; George F. Atkinson describes and illustrates three new genera of the higher fungi, the names proposed being *Eomycenella, Eoterfezia* and *Dictybole. Eoterfezia* is taken as representing a new family, which is named Eoterfeziaceæ. Edward W. Berry presents a paper 'On the Phylogeny of *Liriodendron,*' tracing the development of the type through fossil forms to the present *L. Tulipifera.* Mel. T. Cook reports polyembryony in *Ginkgo;* Hermann von Schrenk describes a root rot of apple trees, and E. M. Wilcox shows that *Stipa Hassei* is not a good species.

The Popular Science Monthly for August has for its article Charles S. Minot's address before the American Association on 'The Problem of Consciousness in its Biological Aspects.' Consciousness is considered as the most important factor in the evolution of animals, without which the author thinks evolution could not have taken place as it has done. The following hypothesis is advanced near the close of the paper: Consciousness has the power to change the form of energy, and is neither a form of energy nor a state of protoplasm. William H. Burr concludes his paper on 'The Panama Route for a Ship Canal,' this seeming to be preferable to the Nicaragua route in the more important particulars. Edward Atkinson considers 'Social Bacteria and Economic Microbes, Wholesome and Noxious,' this being a review of the money expended or received for the leading staple products of our country. Edward L. Thorndike discusses 'Marriage among Eminent Men,' concluding that they marry at about the same age and in the same proportion as other men, and David Starr Jordan treats of the problem of 'University Building.' Two of the most important desiderata are shown to be sufficiently long course of training and the conducting of original research in the best sense of the word. Minnie Marie Enteman in a paper 'On the Behavior of the Social Wasps' presents a good study of the psychology of these insects. 'Field Notes of a Geologist in Martinique and St. Vincent,' by Thomas A. Jaggar, gives one of the best accounts of the recent eruptions, and what actually did take place, that has been published. The final article, by Frederick Adams Woods, on 'Mental and Moral Heredity in Royalty,' is an inquiry into the problem which is the more important, environment or heredity, or is there still another factor to be taken into consideration?

The American Naturalist for August, opens with an article by Freeland Howe, Jr., on 'A Case of Abnormality in Cats' Paws,' being apparently the intercalation of an extra digit. It is refreshing to see that it is not considered as a case of reversion. Helen Dean King describes in some detail 'The Gastrulation of the Egg of *Bufo Lentiginosus,*' and Charles W. Hargitt presents some 'Notes on the Cœlenterate Fauna of Woods Hole,' which includes descriptions of several new species. William A. Hilton has a very careful study of 'The Body Sense Hairs of Lepidopterous Larvæ,' concluding among other things that in most species all body hairs are sensory and supplied by the bipolar cells. Hannah Teresa Rowley notes the 'Histological Changes in

Hydra viridis during Regeneration' stating that it seems probable that the new cells are formed by division of the old cells throughout the entire piece. There are numerous good reviews of recent biological literature.

The Plant World for June contains 'How Shall our Wild Flowers be Preserved?' by A. J. Grout, being the third of the prize essays on that subject; 'The Yellow Water Lily of Florida,' by A. H. Curtiss who notes that this rare species is likely to be extirpated by the water hyacinth; and 'Habits of the Deep-set Bulbs of *Erythronium*' by Grace Stoddard Niles. Among the briefer articles is the report of the Secretary of the Wild Flower Preservation Society. The Supplement on the Families of Flowering Plants concludes the treatment of the order Gentianales and commences that of the Polemoniales.

The Wilson Bulletin for June contains a good article by Lynds Jones on the winter birds of Lorain Co., Ohio, and the same writer notes *Mareca penelope*, taken on the Licking Reservoir in March as 'A Bird New to Ohio.' Besides other articles the number contains a 'List of the Birds of Yokima County, Washington,' by Wm. Leon Dawson.

DISCUSSION AND CORRESPONDENCE.

SO-CALLED SPECIES AND SUBSPECIES.*

PERHAPS no discussions in zoology are as uninteresting and apparently profitless, to persons not engaged directly in them, as are those concerning the status of so-called species and subspecies. But a discussion may be uninteresting and apparently unprofitable, and still involve questions of great import, and these two ornithological papers which have just appeared from the Government press, cannot fail to raise serious questions in the mind of the average reader. Both papers deal with diversities of size and color in some of our common birds, and ten new trinomial names are added to our already overburdened nomenclature. For what do these names stand? Do they represent anything real and tangible? Is the phase of systematic ornithology exploited by these authors contributing anything of value to science, or is it simply making 'confusion worse confounded'?

Mr. Oberholser's pamphlet represents a very large amount of painstaking work, as 2,150 specimens of horned larks were carefully examined and compared in the attempt to make as complete and satisfactory a revision of the genus *Otocoris* as possible. The results are worth examination, but not so much for their intrinsic value, as for the revelation to an unusual degree of a zoological tendency, characteristic of the present day, and especially marked among ornithologists, the worth of which demands careful estimation. The author divides the horned larks into six species, although he admits that possibly two of these may be reduced to subspecific rank, ultimately. Of these six species, one well-marked form, of which little is known, comes from South Africa, while the others are confined to the northern hemisphere. Only one of the five species occurs in North America, but as 2,122 of the specimens examined represented that species, it will not be unfair to confine our attention to it, *Otocoris alpestris*. Although originally described by Catesby from the coast of the Carolinas, it is found not only throughout North America (except the extreme southeast) and southward into Colombia, but also in northern Europe and Asia. It therefore inhabits a wide range of greatly diversified country, and would naturally be expected to exhibit considerable variety in color and size. The important question which this monograph raises is how far is it desirable to recognize these varieties by name? Or better, are the diversities of size and color in a specified geographical area, sufficiently constant to warrant recognition as subspecies?

* 'A Review of the Larks of the Genus *Otocoris*.' By Harry C. Oberholser, Assistant Ornithologist, Department of Agriculture. From the Proceedings of the United States National Museum, Vol. XXIV., pp. 801–884 (with Plates XLIII.–XLIX.) [No. 1271]. Washington, Government Printing Office. 1902.

'Descriptions of Three New Birds from the Southern United States.' By Edgar A. Mearns, Major and Surgeon, U. S. Army. From the Proceedings of the United States National Museum, Vol. XXIV., pp. 915–926 [No. 1274]. Washington, Government Printing Office. 1902.

To many persons it would seem to be almost an axiom that a character which can not be stated in language or in figures of any sort is not sufficiently conspicuous to bear the weight of a name. But Mr. Oberholser, holding a point of view occupied by many ornithologists and mammalogists (and perhaps other zoologists) which is adding to current zoological literature hundreds, if not thousands, of trinomials every year, thinks differently; he says (page 803): "Various more or less perfect intermediates are very perplexing, and no means of determination can possibly be of value except the actual comparison of specimens, coupled with an accurate knowledge of the relative value of the proper differential characters. Satisfactorily to present such information in printed diagnoses is manifestly out of the question, for characters that will serve to identify even typical examples of some of the more closely allied forms are frequently almost impossible to express intelligibly on paper." Notice especially the contention that even the actual comparison of specimens is not itself sufficient for the identification of a bird unless such comparison is made by an expert. If this is so, systematic ornithology is in a bad way, for if the expert can not express the distinguishing characters 'intelligibly on paper,' what are we going to do when he dies? Of what possible use is it to attempt to maintain distinctions so fine that even a well-trained ornithologist can not tell upon what form his observations are made? Such distinctions might be of value if they had any geographical meaning, but even this is denied them in the case of *Otocoris,* for in Kansas the student must distinguish between four possibilities, and in northwestern Mexico near the international boundary line, he may come upon any one of *seven* of Mr. Oberholser's 'subspecies.' Nor will the season of the year help him much, for in Kansas at least three forms occur in winter, and in northwestern Mexico near the 'Line,' unless the larks keep very strictly to the limits laid down for them, no less than half a dozen forms may breed.

Another rule which to the layman would seem to be axiomatic is that characters which can not be recognized regardless of the locality where the specimens are collected are worthless. But Mr. Oberholser says (page 803) that 'the identification of specimens without regard to geography is, to say the least, liable to be difficult.' No one can read the paper carefully and not realize the magnitude of the difficulty. An illustration may be taken from the subspecies *chrysolæma,* which is given as resident in Mexico. Speaking of some specimens from Puebla and Vera Cruz, this statement is made (page 844): "If comparison be instituted between these specimens and typical *actia* from California, however, it will be at once seen that they are exceedingly similar, and, to say the least, difficult to distinguish, forming another of those perplexing cases of forms reduplicated by apparent intergradation of two or more others." In other words, these birds are *O. a. chrysolæma* in Mexico, but if taken in southern California, they would be *O. a. actia!*

Another point which will be a great surprise to many unsophisticated persons is the recognition given to very slight differences in size. Many examples might be given, but the following will suffice.

O. a. enthymia is said to be 'decidedly smaller' than *O. a. arcticola,* but the latter has the wing (total lengths are not given) averaging only 6.7 mm. longer than the former, the tail 0.3 mm. and the exposed culmen is the same in both forms. Even the apparent difference in the length of wing is not really so great, for only fifteen specimens of each form were measured, and the difference between the maximum and minimum wing measurement of the two is just 1 mm. Again the subspecies *peregrina* is based on a single specimen (from Colombia), which is distinguished from *insularis* (from the Santa Barbara Islands) only by size. It is said to be 'very much smaller.' As a matter of fact, the wing is only 5 mm. shorter than the average *insularis,* the tail 1.4 mm. shorter and the culmen .08 mm., and, moreover, the tail is 3 mm. *longer* than the minimum *insularis,* and the bill, tarsus and middle toe are each half a mm. *longer* than the minimum for that species. Clearly we have here an exaggerated idea of the length of a millimeter; the 'inch on the end of a man's

nose' is as nothing in comparison to the millimeter on the end of a lark's tail! If the phrases in reference to color, such as 'much darker,' 'decidedly paler,' 'much more yellowish,' etc., indicate as trivial differences as the statements regarding size, it is no wonder it was impossible to express them 'intelligibly on paper.'

Turning now to Mr. Mearns' paper, we find the same evidence of ability to distinguish differences, which, while of course worthy of note, are altogether too trivial to be in any degree constant. The 'new' subspecies of grasshopper sparrow is said to be 'smaller' than *C. s. passerinus,* yet the differences are so slight that it is an exaggeration to say they are two per cent. of the measurements. The 'new' martin is also said to be 'smaller' than the typical form, though the figures given belie the statement. And finally the 'new' Rocky Mountain nut-hatch is boldly characterized as the 'largest known form of *Sitta carolinensis,*' although by the measurements given it averages 1 mm. *shorter* than the typical form, and the wing averages less than 3 mm. longer. Let us hope that the statements in regard to color mean more than those in regard to size.

These two papers are not exceptional. One cannot be at all familiar with American ornithological and mammalogical literature and not recall numerous cases of similar recognition of utterly trivial differences. The chief value of systematic zoology lies in its service as a basis for progress in knowledge of the laws of distribution, variation and evolution. Recognition of well-defined subspecies is essential to accurate knowledge, but bestowing names upon all sorts of individual diversities and inconstant trivialities is the very worst extreme. In Mr. Oberholser's paper, his first paragraph closes with these sensible words (page 801): 'But the manner and degree of variation must be properly set forth before the full significance of these facts can be appreciated, and this should be the ultimate aim of systematic research—not, as seems only too often to be considered, the mere facilitation of the determination of specimens in the cabinet'; but can degrees of variation be properly set forth if they cannot be 'intelligibly expressed on paper'? One can only feel that were Mr. Oberholser as quick to see resemblances as he is to detect differences, and as eager to unify and reduce as he is to subdivide and magnify, the result of his review of the horned larks would have been very different, much more acceptable and, I venture to think, much nearer the truth.

HUBERT LYMAN CLARK.

LELAND STANFORD JUNIOR UNIVERSITY.

A SUGGESTION.

THE able and interesting address on 'The Universities in Relation to Research,' by President James Loudon which was published in SCIENCE, June 27, 1902, constrains me to venture a suggestion that I have had in my mind for several months.

At the outset may I assure my readers that I make no pretension to a knowledge of all the local conditions? I write merely as a casual traveler, but one who is greatly impressed with the prospects of California from a non-material point of view.

When I paid a hurried visit to Palo Alto last November, I felt what a splendid opportunity there was for a new departure in the history of universities. Nicely situated in a beautiful country enjoying a fine climate, with buildings of an interesting style of architecture and with a princely endowment, the possibilities are very great. The well-equipped university near the largest city of the state, which is only some thirty miles distant, is quite capable of supplying the academic needs of the State for some time. There does not appear to be, therefore, any pressing need for the foundation of a new university on similar lines to that of the State University.

Supposing the university authorities resolved not to do any ordinary university teaching, say for fifty years, but decided on making it a home for all kinds of research, what might not be the benefit to learning in general and to the state in particular? If the most able investigators and scholars were enticed to make Palo Alto the center of their labors, there is no knowing what good might result.

Research first and foremost should be its watchword, and students should be trained solely for research, whether in the humanities

or in science. The geographical position of California suggests some of the main lines of research—all that is in or around the Pacific Ocean. As the greater part of the researches could be conducted most profitably at various spots within this area, so the course of instruction, or rather the direction of the research, in any subject would be undertaken wherever the professor happened to be. For example, the professors of geology, botany, zoology and anthropology, with their students, might be for one year in some island in the Pacific. The professor of comparative religions and his students might make investigations from Kamchatka to Australia.

The ordinary European academic mind would stand aghast at the upsetting of traditional methods and would say promptly that, even supposing such a scheme were in any way desirable, it would be unworkable. Personally I believe it would prove most stimulating and valuable and I have no doubt that American wits could devise a working scheme.

Alfred C. Haddon.

Cambridge, England, July 10, 1902.

SHORTER ARTICLES.

STRATIGRAPHY VERSUS PALEONTOLOGY IN NOVA SCOTIA.

The recent discussion of the Upper Paleozoic formations in the region of the Bay of Fundy brings the value of fossils as means of age determination, even as between two major time divisions, somewhat acutely in question. Beds which on stratigraphical grounds have been classed as Middle Devonian appear on the evidence of floras and faunas to be Carboniferous.

Certain fossiliferous terranes at Riversdale and on the Harrington River, Nova Scotia, are referred by Dr. R. W. Ells and Mr. Hugh Fletcher, statigraphers, to the Middle Devonian, and are correlated with the 'fern ledges' (Little River group) at St. John, which were regarded by Sir William Dawson also as Middle Devonian. The correlation of the Nova Scotia beds with the St. John 'fern ledges' is agreed to by Mr. Robert Kidston, the foremost British authority on Paleozoic Plants, and the writer; but each of us, quite independently and without knowledge of the other's views, unhesitatingly referred the plant beds, both at St. John and at the Nova Scotian localities, to the Caribonferous. The St. John flora, which is more complete, is regarded by the writer as probably of Upper Pottsville age and by Mr. Kidston as belonging to the Lower Coal Measures, the latter in Great Britain appearing to closely correspond paleobotanically to the uppermost Pottsville of the northern Appalachian district.

The gist of our conclusions has been given by the Nova Scotian geologists; but the paleontological evidence has been published only in part. Mr. Kidston submitted a report from which extracts have been made by Dr. Ami, who is personally not responsible for silence in regard to the rest of it. The evidence in the writers hands, which concerns the detailed study of the species and their geographical and vertical range in other portions of this continent, cannot properly be presented in full in advance of the publication of his monograph of the floras of the Pottsville formations, but an examination of the material from St. John described by Sir William Dawson and a comparison of it with the Paleozoic floras as yet made known in other regions of the world is in itself sufficient to prove the Carboniferous age of the beds to most paleobotanists.

The paleontological data for the age determination are not, however, confined to fossil plants. The beds in question contain vertebrates, crustacea, insects, pelecypods, ostracods and annelids. Collections of these fossils have been made and forwarded to various specialists, but of the results of the examinations by the faunal experts and of the conclusions communicated very little indeed has been made public, though reports seem long ago to have been submitted. From a short unofficial article* published by Dr. H. M. Ami, we learn that the ostracods were submitted to Professor T. Rupert Jones, and the crustacea to Dr. H. Woodward; and that *Hylopus Logani, Sauropus Dawsoni, Bellinurus grandævus, Prestwichia* sp., *Leaia tricari-*

* *Proc. N. S. Inst. Sci.*, Vol. X., pt. 2, pp. 162–178, 1900.

nata, L. Leidyi var. *Baentschiana, Estheria Dawsoni, Anthracopalæmon* n. sp., *Carbonia* sp., *Anthracomya elongata, A. obtusa,* and *Spirorbis eriana,* were among the fossils collected. Further, Dr. Ami, who in 1897 and 1898 seems to have made extensive collections, states that although he constantly made search for Devonian fossils in the beds under consideration, only Carboniferous types were discovered. He therefore distinctly refers the beds to the Carboniferous, although, for stratigraphical reasons apparently, he places them in the Lower Carboniferous.

At this time, perceiving that the paleontologists were going astray and that by referring the beds in question to the Carboniferous they had 'hindered not helped in mapping the comparatively simple geological structure of these formations' in Nova Scotia, Mr. Fletcher in a paper* on 'Geological Nomenclature in Nova Scotia,' sounded a note of warning, and stated the real age and 'simple geological structure' of the beds as he considers these to have been irrefragably established stratigraphically by Dr. Ells and himself. By means of the parallel column he graphically displays the supposedly ridiculous blunders of the paleontologists, among whom the paleobotanists receive special attention. As Mr. Fletcher had misconstrued certain statements of the writer besides erroneously crediting him with a probably erroneous correlation of the Union beds, the writer, in an article† on 'Some Paleobotanical Aspects of the Upper Paleozoic in Nova Scotia,' expressed his views more explicitly and suggested that there might have been a mistake either in tracing the beds or in interpreting the structure. The region is one of metamorphic and locally of closely folded strata which are extensively covered by drift. It is therefore one in which stratigraphic work, when at variance with the paleontology, does not command unqualified confidence. The heresy of these suggestions is illuminated in the contributions and communications published by Dr. G. F. Matthew and Dr. Ells during the last twelve months.

Since the burden of this criticism and correction is addressed to the paleobotanists, and since the vehemence, volume and ubiquity of the communications may lead casual readers to conclude that the question is settled and that the paleontologists have abandoned faith in the faunal and floral evidence in the beds as means of discriminating Carboniferous from Middle Devonian, it becomes a duty to notice these articles and to point out some obstacles in the way of so speedy a termination of the discussion.

In a communication, 'Are the St. John Plant Beds Carboniferous?' Dr. Matthew* states the sequence of the Upper Paleozoic formations in eastern New Brunswick, and very briefly outlines the geological history of the region as prevailingly interpreted. He also argues that the St. John genus *Megalopteris* assuredly existed before the Pottsville (Millstone Grit), it having been found, he says, by Andrews in earlier beds in Ohio, and by Lesquereux in beds of Mauch Chunk shale chiefly in the southern and the Mississippi states. This *Megalopteris* proof is founded on a false premise, the beds of the South and of Ohio being in the Pottsville, lower than which the genus does not seem to have been found in any part of the world.

In the next paper, on 'The Devonian of the Acadian Province,' Dr. Ells† repeats the conclusions of the stratigraphers that the St. John plant beds (Little River) are beneath not only the Lower Carboniferous Limestone, but also the 'lower sandstone group' (which is generally regarded as Lower Carboniferous, but which Dr. Ells seems to regard as Devonian) and a great portion, at least, of the underlying Perry beds of eastern Maine. The paper contains no stratigraphical details. Dr. Ells lays great stress on Sir William Dawson's conclusion that the St. John plants are Middle Devonian, and even uses it as argument to show that the Riversdale plants also are Middle Devonian, though Sir William's insistence that the latter were not Devonian, but Carboniferous

* *Trans. N. S. Inst. Sci.*, Vol. X., pt. 2, pp. 235–244.

† *Can. Rec. Sci.*, Vol. VIII., No. 5, January, 1901, pp. 271–280.

* *Amer. Geol.*, June, 1901, pp. 383–386.

† *Can. Rec. Sci.*, Vol. VIII., No. 6, pp. 335–343.

ous (Millstone Grit), precipitated the present controversy.* Also Dr. Ells agrees with Mr. Fletcher in placing the Horton, which Dawson referred to the Lower Carboniferous and correctly correlated with our Pocono, in the Devonian, the 'Carboniferous limestone' being made the lowest formation of the Carboniferous.† A considerable portion of Dr. Ells's article and the whole of the communication by Dr. Matthew, which immediately follows it in the same magazine,‡ are devoted to proof that Dawson's reference of the St. John plants to the Middle Devonian was not due to the influence of his statigraphical colleagues. This point, on which I seem to have been mistaken, is a matter of history of opinion, and, though interesting as such, does not affect the geological facts of the region.

The latest contribution to the discussion, 'A Backward Step in Paleobotany,' by Dr. Matthew,§ demands respectful attention both for its matter and its dignified place of publication. In part it attempts to meet a call for conclusive stratigraphical proof that the St. John plant beds are Middle Devonian. The first half of the paper contains a statement of the stratigraphical arguments in a form more extended than in the *American Geologist* for June, 1901. Here again the strongest argument seems to be the metamorphism seen in the Little River group and other beds supposed by Dr. Matthew to be older than Carboniferous. The first of the profile sections included to show the stratigraphy of the plant beds is conclusive as to Middle Devonian, if it is correct both as to stratigraphy and as to correlation; but in view of the small portion of the diagram occupied by rocks above sea level, the incompleteness of the exposures, and the paleontological evidence I find myself unwilling to admit so simple a structure. The second of the two sections presents what seems an isoclinal structure involving a fault which is not shown. Any one of several interpretations may be put upon it. Dr. Matthew perhaps understands the true structure; but the diagram is too equivocal to demonstrate it.

The remaining half of Dr. Matthew's paper is devoted to proof by paleobotany itself. Here again, as in his former article, his chief argument that the *Megalopteris* plant beds of the Mauch Chunk in the Appalachian region carried the St. John flora across from the Middle Devonian to the Pottsville, falls flat when we recall that the *Megalopteris* beds supposed to constitute the bridge are now recognized by the stratigraphers as not in the Mauch Chunk at all, but as lying within the Pottsville. The discussion of other paleobotanical aspects of the St. John plant beds, and especially the doubtful identifications of the older types reported in the latter, requires greater space than is here available; but before passing on it may be noted that probably over 60 per cent. of the valid plant species found at St. John are also in hand from the Pottsville in the Appalachian trough, while it is very doubtful if three species recognized elsewhere as characteristic Devonian plants are present.

The paleobotanists do not contend that there are no beds of Middle Devonian age in southern New Brunswick, or that all the rocks of Nova Scotia that have been correlated with or mapped as representing the plant-bearing formation at Riversdale are Carboniferous. But, after reading the statements and inspecting the profiles lately published, it still seems proper to inquire whether, in the closed folding and faulting inevitably indicated though not explained in the section from the vicinity of St. John, some segments of Carboniferous terranes have not been thrown in a false position as well as altered; and whether in tracing the Devonian formations through the largely

* H. Fletcher, *Trans. N. S. Inst. Sci.*, Vol. X., pp. 236–237.

† The suggestion made by the writer (*Can. Rec. Sci.*, Vol. VIII., p. 279) that this limestone 'may be much younger than is generally supposed,' by which it was meant that, if the Riversdale plants were actually beneath the limestone, the latter must at least occupy a high place in the Lower Carboniferous, is interpreted by Dr. Ells as necessitating the reference of the 'Carboniferous rocks proper' to the place now assigned to the 'Permocarboniferous, or possibly the horizon of the Cretaceous.' This seems a needless alarm.

‡ *Can. Rec. Sci.*, Vol. VIII., No. 6, pp. 344–345.

§ *Trans. Roy. Soc. Can.*, 1901, sec. IV., pp. 113–122. Dated 1901, but printed in 1902.

drift-covered region of Nova Scotia an error has not been committed in correlating them with the beds carrying Carboniferous fossils at Riversdale and Harrington River.

Speaking for himself only, the writer does not regard the evidence yet adduced by the stratigraphers as sufficiently complete to show beyond doubt that this remarkable assemblage of plants, consisting largely of types which nowhere else in the world have been found below the Waldenburg stage or the Pottsville (Millstone Grit) of the Upper Carboniferous, existed in eastern Canada during and from Middle Devonian time. Many of the species and several of the genera are, so far as known, peculiar to and characteristic of the Upper Carboniferous. A small portion of the flora is common to the Lower Carboniferous; but very little of this element is characteristic of the latter, while a close examination of the material from St. John tends to bring into doubt the identification of the few forms published as characteristic Devonian species.

No trace of this extraordinary paleobotanical anomaly appears in the thoroughly studied magnificent section of the Devonian near the Gulf of St. Lawrence, nor have any signs of such a condition yet been found in the Devonian of eastern Maine, New York, or any other region of the world. It is a remarkable fact if a flora almost exclusively composed of characteristic Carboniferous species, most, by far, of which are typical of the Upper Carboniferous, was isolated in the region of the Bay of Fundy both in and after Middle Devonian time; but it is still more remarkable if this flora were accompanied there by a likewise isolated Carboniferous molluscan fauna. Conditions producing isolation of a land flora are not generally readily reconcilable with contemporaneous and continued isolation of the invertebrates of the same region.

As to the precise characters of the faunas of the beds in question and as to the weight of their evidence in the age determination of the formations, we are but partially informed, since the reports and opinions of the several specialists to whom the materials were communicated for examination, or whose paleontological views were solicited, have not been made public. As has already been noted, materials representing vertebrates, crustacea, polecypods, and ostracods were during several seasons gathered in some quantity and placed in the hands of experts. These reports and opinions are awaited by paleontologists and geologists alike. We are in a general way informed that all the fossils gathered are more or less distinctly indicative of Carboniferous age, all efforts to discover Devonian types in the beds being unsuccessful; and it is perhaps fair to assume that had one or more of the experts, to whom some class of fossils was sent, reported in favor of their Devonian (not to say Middle Devonian) age the stratigraphers would not have omitted mention of the fact. The circumstances attending the discussion suggest a trial at which the testimony of the faunal witnesses has not been admitted.

What is at present most needed is a thorough investigation of the faunas as well as of the floras of the terranes in question, especially in Nova Scotia. If the plants are misleading the paleobotanists to overconfidence and if we are mistaken as to the non-existence of such a remarkable flora, containing so large a proportion of Upper Carboniferous types, in the Middle Devonian and living in isolation until Upper Carboniferous time, there is no one to whom the truth means more or who realizes more fully than the paleobotanist the importance of the fact. If the testimony of the plants is false, the evidence of the faunas will correct it; and if the beds in question are Middle Devonian the fossils themselves will prove it. Let us have a thorough paleontological study of the beds, and the paleontological question will settle itself.

DAVID WHITE.

PRELIMINARY STUDIES ON THE RUSTS OF THE ASPARAGUS AND THE CARNATION: PARASITISM OF DARLUCA.

DURING the past two years, the writer has been carrying on a series of experiments at the University of Nebraska, in cooperation with the United States Department of Agriculture, in inoculations with the asparagus rust (*Puccinia asparagi* DC.) and the carnation rust (*Uromyces caryophillinus* (Sch.) Schroet).

These experiments have for the most part been conducted in the greenhouse, where there was an advantage to be derived from a partial control of the heat, light, moisture, wind, etc., especially in the control of natural infection. The inoculations have been made after the usual manner by spraying the plants and placing the spores on the moistened stems or leaves of seedlings or established plants. The first inoculations on asparagus were made December 12, 1900, with uredospores obtained from the then dead plants in the field. Spores, obtained in the field on March 28 and April 24 following, gave successful inoculations also, the uredospores having retained their vitality during the winter when protected by the unbroken epidermis of the asparagus.

The period of incubation in the greenhouse has varied from eighteen to eight days. What it is in the field has not been determined, but it probably varies there as it did in the greenhouse.

Since the rust was dependent upon its host for its food, it seemed that the conditions of heat, sunshine and moisture necessary for the growth of the asparagus ought to have some effect on the development of the rust as indicated by its period of incubation, or the time that elapsed between the time of inoculation and the first appearance of the uredospores through the ruptured epidermis of the asparagus.

In these experiments, the variation could not have been due to a lack of moisture, for at times some of the plants were often kept too wet, as indicated by the growth of algæ on the surface of the soil. The plants, of course, did not grow well, neither did the rust, the sori being small and the spores light-colored. The two factors of heat and sunshine are so closely related to each other that it would be almost an impossibility to separate them. During the spring and summer the sun was the only source of heat in the greenhouse.

When the temperature, the number of hours and the intensity of the sunlight were low during the winter months, from fourteen to seventeen days were required for the sori to appear; during the spring months, when there was a gradual increase in the number of hours of sunshine and the intensity of the sunlight, the number of days was reduced from twelve to eight. When the mean daily temperature in the greenhouse was 69° and the average hours of sunshine* were five, it required fourteen days for the sori to appear after an inoculation was made; and when the temperature increased to 76° and the number of hours of sunshine increased to 6.3, only eight days were required; the period of incubation being in each case inversely as the temperature and the hours of sunshine.

The susceptibility of the plants to inoculation depended to a large extent upon their vigor and rate of growth. Attempts were made repeatedly, not only on the asparagus but on several species of the Caryophyllaceæ, to inoculate them when they were not growing well. It was tried on repotted plants, those attacked by insects, slow-growing seedlings and mature plants, with little if any success, while out of forty-two plants which were making a vigorous growth and inoculated at the same time 37, or 90 per cent., of them produced sori.

Successful inoculations with uredospores were made on the principal varieties of the garden asparagus (*Asparagus officinalis*) and the following species grown for decorative purposes: *A. plumosus nanus, A. broussonetii* and *A. verticillatus.*

It was a difficult matter to germinate the teleutospores by the methods employed. During the spring spermogonia were produced on seedlings of *A. officinalis* in seven days, followed by æcidia. Infection from the æcidiospores was brought about by sprinkling the plants with the hose. Spermogonia were also produced on *Smilax* (*A. medeoloides*), but no æcidia.

In many instances teleutospores have followed the production of uredospores, thus giving all the stages of the asparagus rust from inoculations.

The most unexpected results have been obtained from inoculations made on the com-

* These results were obtained from the observer for the Weather Bureau at Lincoln, Nebr., and represent the time when the sun was actually shining.

mon onion (*Allium cepa*), all three stages having been produced. Mr. E. W. D. Holway reports that he collected æcidia on 'winter onions' the latter part of May and the writer collected two specimens about a month later. In each of the above instances asparagus was growing near 'winter onions.' The great similarity of the asparagus rust (*Puccinia asparagi*) and the onion rust (*P. porri*), together with the results obtained by inoculation and the æcidia recently collected on the onion, is very suggestive of the identity of the two rusts. But Klebahn* has been able to inoculate several species of *Allium,* including *A. cepa* with *Melampsora,* producing a *Cæoma* in each case, so that it appears that the *Alliums* are very susceptible to the attack of the rusts when inoculated.

The writer is conducting experiments along the same line with other liliaceous plants, but as yet results are not ready for publication.

Inoculations of a number of species of *Dianthus* and *Gypsophila* with the uredospores of the carnation rust (*Uromyces caryophyllinus* (Sch.) Schroet.) have given the same general results, so far as the effect of temperature, sunlight and susceptibility is concerned, as was obtained for the asparagus. It has been demonstrated that the carnation rust is local instead of being distributed through the plant, and that certain varieties are practically immune.

There is often associated with both the asparagus and carnation rusts another fungus (*Darluca filum* Cast.) thought to be parasitic on the rust. Some observations have led the writer to conclude that it is not parasitic on the rust and that it is not so beneficial as is generally supposed. Its saprophytic tendencies have been demonstrated by growing it on various culture media, both animal and vegetable, including bouillon-gelatine and bouillon-agar, asparagus-agar, potato, canned asparagus stems, etc. On some media it produced pycnidia in three to five days. Spores from pure cultures when inoculated on rusted asparagus gave the characteristic pycnidia with the curled masses of spores issuing from them. Only negative results have as yet been obtained on the stems of living asparagus, although it flourishes on the cooked stems, and there are strong indications that it may be parasitic on asparagus. A complete account of the work will be published later.

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* Klebahn, *Zeitschrift für Pflanzenkrankheiten,* 12: 1, 17, 1902.

*CHEMICAL INDUSTRY IN GERMANY IN 1901.**

RECENTLY published statistics of the chemical industry in Germany for the year 1901 show that it has shared in the general business depression of the Empire, though the results are less unsatisfactory than in other branches of manufacture.

Among the reasons assigned for the depression are a tendency toward overproduction, the increased cost of raw materials, the high price of coal and of labor, and proposed changes in the tariffs on many articles which enter into chemical manufacture. It is also pointed out that in the United States, in Russia, and in several other countries, there is a growing interest in this branch.

The following figures show the imports and exports for the years 1900 and 1901. The articles included are the more important drugs, pharmaceutical supplies, and dyestuffs or materials entering into the manufacture of the same:

Year.	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	Metric tons.		*Metric tons*	
1901	1,219,889	$66,164,000	889,550	$88,298,000
1900	1,114,554	62,832,000	834,229	83,776,000

While these figures show an excess of exports over imports, and a gain in exports for the year 1901 over the preceding year, the cost of raw materials and of labor has left manufacturers but small returns for their investments.

Statistics of dividends paid by concerns engaged in this branch of manufacture during the year 1901 are not yet fully announced, but

* Consular Report from H. W. Harris, Mannheim.

it is claimed that they will not differ greatly from those of the preceding year, when they showed a falling off. One hundred and twenty-one stock companies, having a combined capital of about $83,000,000, paid in 1900 an average dividend of 12.33 per cent., as against 13.32 per cent. in 1899. Nineteen companies paid no dividends in 1900; 20 paid less than 5 per cent.

As will appear from the following figures, the gain in imports in 1901 was marked in certain articles, particularly in coloring matters:

Article.	Gain in Imports in 1901.
Ammonium sulphate	$1,071,000
Peruvian bark	238,000
Iodine	178,500
Chile saltpeter	178,500
Superphosphate	476,000
Cyanide of potassium	357,000
Chloride of lime	178,500
Explosive materials	238,000
Alizarin	476,000
Aniline	952,000
Zinc, white	238,000

As is well known, the manufacture of dyestuffs, and especially of coal-tar products, has been a specialty of the Germans. This branch of chemical industry has shown a marvelous growth and has apparently yielded good returns on the money invested.

The exports of aniline colors for the past six years have been:

Year.	Quantity.	
	Metric tons.	*Value.*
1901	25,029	$19,213,000
1900	23,781	18,402,000
1899	22,705	17,839,000
1898	19,712	17,131,000
1897	17,639	15,969,000
1896	16,232	15,460,000

The German manufacturer of chemicals is dependent upon foreign countries for most of his raw product and for an outlet for his goods; he is also hampered by the high price of fuel and freights, and he realizes that his main reliance is the supply of trained chemists in Germany. A summary of the statistics of this industry in the United States, taken from the recently published census returns, has been published somewhat widely in Germany; and the certainty of vigorous and increasing competition on the part of the United States in this important branch is admitted.

SCIENTIFIC NOTES AND NEWS.

We have noted that four men of science—Lord Kelvin, Lord Lister, Lord Rayleigh and Sir William Huggins—have been included in the new order of merit founded by King Edward at the time of his expected coronation. Attention should further be called to the fact that in addition to these four men of science there are in the order three generals, two admirals, two men of letters and one artist. Science consequently appears to be in advance of any other department in the number of those selected as especially noteworthy, and to represent one third of the most eminent men (excluding statesmen) in Great Britain.

It is said that Captain Willard Herbert Brownson, now commanding the battleship *Alabama,* has been selected as superintendent of the Naval Academy at Annapolis, to assume his duties in October. Captain C. H. Davis, superintendent of the Naval Observatory, will, it is understood, succeed Captain Brownson in command of the *Alabama.*

Despatches from Germany report that Professor Virchow has had another fall and is very seriously ill.

A title of nobility has been conferred on the Asiatic explorer, Dr. Sven Hedin.

Mr. Gifford Pinchot, chief of the Bureau of Forestry, is at present in Minnesota conducting experiments on reforestation. He will later go to the Philippine Islands to prepare a report on the forest conditions.

Dr. Whitman Cross, of the U. S. Geological Survey, will spend part of the year in the Hawaiian Islands studying volcanic phenomena.

Mr. J. A. L. Coolidge, instructor in mathematics at Harvard University, has been granted leave of absence, and will spend two years in study abroad.

The centenary of the establishment of the Paris Council of Hygiene was celebrated on July 7. On this occasion gold medals were presented to Professor Proust and M. Schloesing.

PROFESSOR A. W. EVANS, of Yale University, and Mr. Percy Wilson, of the New York Botanical Garden, have gone to Porto Rico to make some further investigations and collections of the flora of that island for the New York Botanical Garden.

LEOPOLDO BATRES, the conservator of national monuments, has returned to Mexico City, after his winter's archeological excavations among the ruins of Zapotecan cities in the State of Oaxaca.

DR. ANTON WEDDIGE, professor of chemistry at Leipzig, has retired.

MR. E. B. BAILEY has been appointed a geologist on the Geological Survey of Scotland.

DR. GRUBER, professor of hygiene in the University of Vienna, has been called to the presidency of the Munich Institute of Hygiene.

A STATUE of Pasteur was unveiled at his birthplace, Dôle, Jura, on August 3.

THE centenary of the death of Bichat, the celebrated anatomist and physiologist, was commemorated on July 22, under the auspices of the French Society of the History of Medicine. An address was made by Dr. Albert Prieur, and a commemorative tablet was placed on the house in the Rue Chanoinesse in which Bichat died. A portrait medal, struck in honor of the occasion, may be obtained from Dr. Prieur, Place des Vosges, Paris.

MAJOR JOSIAH R. PIERCE, a well-known civil engineer, died at Washington on July 31. He was born in 1861 and had been connected with the Coast and Geodetic and Geological Surveys, and had been professor of civil engineering at the Columbian and Catholic Universities. He served as a major of engineers in the Spanish war and had been engaged in a number of topographical surveys.

PROFESSOR SAFARIK, who held the chair of chemistry and later of astronomy at the University of Prague, died on July 2, at the age of seventy-three years.

WE also regret to learn of the deaths of Professor Gerhardt, an authority on the diseases of children and professor at the University of Berlin, who died at the age of sixty-nine years; of Mr. Benjamin Martell, a British engineer, at the age of seventy-seven years, and of Dr. Alexander Kowalski, an astronomer at the observatory at Pulkova, at the age of forty-four years.

THE French Minister of Agriculture has established an office for agricultural information, the object of which is to act as a bureau of correspondence and a means of popularizing scientific agriculture.

A YEAR ago M. M. Bischoffsheim presented the astronomical observatories of Nice and Mt. Mounier to the French Government. The anniversary of this event was recently celebrated by a dinner to M. Bischoffsheim, at which a number of the most eminent French astronomers were present.

THE Council of the British Medical Association is prepared to receive applications for a scholarship of £200 for the study of some subject in the department of State Medicine in memory of the late Mr. Ernest Hart.

A BACTERIOLOGIST is wanted for the Scottish National Antarctic Expedition. The conditions may be learned by application to W. S. Bruce, 21 Hill Place, Edinburgh.

THE French Surgical Association will next meet at Paris beginning on October 20. The association meets under the presidency of Dr. Jacques Reverdin, professor at the University of Geneva and foreign associate of the society.

THE Royal Institute of Public Health will hold its next annual congress in Exeter, August 20 to 27. The work will be arranged in five sections: (1) Preventive medicine and vital statistics; (2) chemistry, climatology and bacteriology; (3) engineering and architecture; (4) municipal and parliamentary hygiene; (5) veterinary and farm hygiene.

IT is announced that in the autumn a new journal, entitled *Electrochemical Industry*, will commence publication, with Dr. E. F. Rober as editor.

QUEENSLAND has given up its weather bureau, and the services of Mr. C. L. Wragge and others have been dispensed with. It is hoped that an arrangement may be made by which the service will be continued by the federal government.

THE directors of the meteorological observa-

tory on Ben Nevis have decided to close the institution in October.

The Berlin correspondent of the *Medical News* describes the recent exposition of the Berlin Medical Society which, it appears, was arranged in six different groups: (1) Anatomical and pathological model preparations; (2) Phantoms and plastic models; (3) Tables and Charts, including Photography and Radiography; (4) Microscopy in all its branches; (5) Apparatus for Demonstration; (6) Projection Apparatus. In addition lectures were provided for on eight consecutive nights by the following eminent men: (1) Professor v. Bergmann on the means of medical instruction; (2) Professor Doyen, of Paris, upon the development of surgical technic and methods; (3) Professor Jolly on the pathology of brain and spinal diseases; (4) Professor v. Leyden, demonstrations of diseases of the heart; (5) Professor Wassermann on bacteriology and serum therapy; (6) Professor Liebreich on pharmacology; (7) Professor v. Michel on tuberculosis of the eye; (8) Professor Olshausen on diseases of women and obstetrics.

Progress of the topographic mapping of Kentucky by the United States Geological Survey is indicated by the instructions recently given to Mr. W. L. Miller, one of the topographers of the Survey, to assume charge of a party and conduct the mapping of the territory surrounding Harrodsburg, bounded by latitudes 37° 30′ and 38° and longitudes 84° 30′ and 85°, as far as the length of the field season will permit. Mr. Miller's party will consist of Messrs. F. F. Frank and W. C. Palmer, levelmen; F. Moorhead and J. F. Howard, rodmen, and R. Berry and J. W. Craig, field-assistants. Mr. Miller will later be joined by Mr. Hersey Munroe, topographer, who will have general supervision of the work; he will be accompanied by an assistant, Mr. G. T. Ford.

The daily papers report that the French government has adopted the automatic telephone invention of a Russian engineer. The apparatus does away with 'Central' girls. The subscriber turns five disks, each numbered from 0 to 9, to form the number wanted, whereupon the correspondent is called automatically. If he is absent a sign soon appears saying: 'Rang one minute; no answer,' while the caller's number is registered at the other end, so that he may be called after the person sought returns. When the number desired is already 'busy,' a special buzz is immediately heard. In order not to dismiss all the telephone girls together, which might disturb the labor market, the new system will be introduced gradually. Three towns of moderate size are being equipped now—Limoges, Nîmes and Dijon.

UNIVERSITY AND EDUCATIONAL NEWS.

The will of the late Charles Kendall Adams, president of the University of Wisconsin, gives most of the estate to Mrs. Adams for life. The property is then to go to the University of Wisconsin to establish fifteen fellowships of the value of $10,000 each.

President Butler, of Columbia University, has offered to establish two fellowships for American students to study in France if the French government will establish at Columbia University two fellowships for students from France.

The enrollment at the summer session of the University of California, including the Marine Biological Laboratory at San Pedro, is 829, an increase of 30 over last year.

The Academy of Münster has been made a University.

Dr. Edmund James will be installed as president of the Northwestern University, October 21. The exercises will cover three days, and formal invitations are to be sent to prominent European and American colleges and universities and learned societies to send delegates.

Dr. O. Vogt has been made assistant director of the physiological laboratory of the University of Berlin.

Professor David Hilbert, professor of mathematics at Göttingen, has declined a call to the University of Berlin.

Dr. Johannes Hartmann, astronomer in the Astronomical Observatory at Potsdam, has been made professor.